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THE AMERICAN
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VOL. 100 APRIL, 1928 No. 4

EDITORIAL

POISON-RUM AGAIN

THE *New England Journal of Medicine* (the newly-adopted name of the long and favorably known *Boston Medical and Surgical Journal*) presents in a recent issue a series of papers on the relation of the number of deaths reported as due to alcoholism to the introduction of denaturing materials in commercial alcohol. The collection might with propriety be called a symposium, for the primary meaning of that word is "a drinking bout." The contributors are Dr. Bigelow, Massachusetts Commissioner of Health; Hermann C. Lythgoe, B. S., chemist to the Massachusetts State Board of Health, and Dr. Reid Hunt, of Harvard University. The main stimulant to the symposium was a statement in a report by the Metropolitan Life Insurance Company, to the effect that the increase of deaths from alcoholism in recent years is probably due to toxic substances not formerly present in commercial liquors. This statement is challenged formally by the contributors to the symposium. They all hold firmly to the opinion that the poisonous ingredient in the great mass of liquor sold, licitly or illicitly, is the alcohol, all the accessories produced in fermentation, whether carefully or carelessly conducted, being of minor influence. These opinions are the result of extensive experience in recent years. Lythgoe furnishes the analytic data, derived from testing many thousands of samples submitted by police and health departments of the state. In a very limited number of cases small amounts of methanol have been found, but the great mass of the samples were of the character of the pre-prohibition liquor. Dr. Bigelow expresses the opinion that much of the agitation about "poison-rum" is due to "emotion," but a much stronger word could be used. The profit that accrues from the legitimate manufacture and

sale of alcoholic beverages is very great, and the many persons sharing in this profit are determined to bring back, if possible, the old conditions. Their efforts find active support and encouragement from those who wish to use alcoholic beverages, and thus "profit and pleasure" are joined in the endeavor to throw a smoke-screen over the facts concerning the effects of intoxicating liquors. Wild declamations about "poison rum," and about the Government being in business as a murderer, have resounded through the land, and it is practically impossible for those who know the facts to get a hearing. Newspapers, generally, give but little space to conservative statements, for sensation is what is wanted, and the balderdash of the whoopers-up of the anti-prohibition party is given large and prominent notice.

As above noted, the data furnished by Lythgoe included many thousand analyses over a few years. It is worth while noting that some years ago Doran and Beyer, of the Internal Revenue Bureau, published the results of analyses of over seventy thousand specimens of confiscated liquors, in which they had not found any ingredient not in normal liquors of pre-prohibition times. In a few cases they found aldehyde in excess of the average in standard liquors, but no evidence can be produced either from physiologic experimentation or clinical experience that such excess has any definite toxic action. The great majority of the samples examined by Lythgoe and other official chemists, and all the samples examined by Doran and Beyer, were distilled liquors, therefore, strong drink. This fact is interesting in view of the claim made that beer and light wines are what the mass of the community wants. In almost all cases in which violations of the prohibition laws have been correctly reported, or deaths from alcoholism recorded, the beverage has been distilled spirit of high alcoholic content.

It is the opinion of most of those who know the facts that the majority of deaths from alcoholism are due to excessive ingestion of the alcohol itself, and that a very small proportion of the illicit liquors sold in the United States has any other distinctly poisonous ingredient. That these facts will be appreciated or accepted by the mass of those who are endeavoring to secure the repeal of the prohibition amendment or the emasculation of the Volstead Act is hardly to be expected, but the impartial citizen should be differently actuated.

HENRY LEFFMANN.

SELECTED EDITORIAL

BARBITAL ADDICTION*

MANY CONDITIONS legitimately call for the medical use of depressants of the nervous system. The relief of pain is doubtless the most prominent illustration, though it is not the only occasion for the therapeutic administration of potent drugs of this class. Cerebral excitation, sleeplessness and certain disconcerting psychic states often require some counteracting influence in the interest of bodily welfare and avoidance of intense distress scarcely less tolerable than the pains of physical injury. Mankind has long made use of agents that would conduce to relief. Vicious habits have thereby become established when the administration was not supervised by an intelligent adviser such as the physician should be.

Alcohol and opium were formerly our principal hypnotics,[1] but they have been superseded largely by others. In this country the force of law as well as a modified public sentiment has served to hasten the change, which is one of substitution rather than omission. The catalogue of the newer hypnotics is a formidable list of synthetic chemical compounds, some of them exhibiting striking usefulness. Meanwhile the layman has not been slow to discover the potency of the novelties and has often applied them to his desires inadvisedly. New drug addictions have thus arisen and brought fresh problems for solution to the innocent physician. When a single practitioner can report, as Work [2] has done, a hundred cases of acute poisoning or chronic addiction with one of these drugs, the situation is evidently one that challenges serious attention.

Barbital, introduced under the trade name of veronal, has a tremendous and increasing lay popularity for self-administration. Its habit-forming propensities are sufficiently well recognized to merit the special designation of barbitalism or veronalism. The opportunity is readily created. Finding himself unable to react adequately to environmental conditions as Work points out, the man who is either constitutionally or acutely below the standard dulls his sensorium with

**Jour. Amer. Med. Assoc.*

[1] Pharmacology of Useful Drugs, Chicago, American Medical Association.

[2] Work, Philip: Barbital (Veronal) Addiction, Arch. Neurol. & Psychiat 19: 324 (Feb.) 1928.

barbital, just as other drugs are used as a refuge from circumstance. It should be remembered, he adds, that a host of proprietary hypnotics now on the market are of the same chemical series as barbital and may induce in greater or less degree the same results. Poisoning resulting from barbital taken in conjunction with one of its congeners is more difficult of treatment and offers a poorer prognosis. According to Work, addiction to barbital does not stop with the production of moderate euphoria. Judgment, orientation as to time, and insight are probably the most severely harmed of the psychic faculties and are the last to clear up in convalescence. Cases of residual defect fall almost entirely in this class. The mentality in this condition precludes complicated criminality or conspiracy, and the appearance does not inspire confidence sufficient for the consummation of any but the crudest frauds or clumsy impositions on friends. Ethical offenses, as against decency, and minor frauds, such as issuing fundless checks and forgery of an unskilful type, are well within the possibilities. Carelessness may well result in acts of an apparently criminal complexion. The paranoid reactions are usually too fleeting to endanger any one, but the dulled sensorium may lead to quasicriminal complaisance with the schemes of others. These are indeed disturbing pictures for the contemplation of nations that are endeavoring with great zeal to free themselves from the more familiar types of drug addiction. The "safe" hypnotics may become menacing to the public welfare.

ORIGINAL ARTICLES

THE PRESERVATION OF FOOD*

By Louis Gershenfeld, Ph. M., B. Sc., P. D.
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MANY OF US LIVING in cities possess imaginations that frequently do not extend beyond the city limits. The majority of people are but little concerned about the processes necessary for transforming crude material into finished, delicate and palatable foodstuffs, and so preserved that they may be made available only when our desires for them are aroused. But few seem to appreciate the many revolutionary changes that science has introduced, so that life-sustaining food may be at hand at all times. Every now and then, however, some of us become annoyed, when the corner storekeeper informs us that a certain food which we enjoy is off the market, or that there is a shortage when more annoyance still is displayed when the bill is presented.

Louis Gershenfeld, Ph. M., B. Sc., P. D.

So that we may appreciate and understand more fully the present methods, which are practiced in the preservation of foodstuffs, let us start the story by picturing before us the cave dwellers.

BACK TO NATURE

The magnificent and beautiful things which have transformed this world are gone: automobiles, aeroplanes and all facilities of transportation; hotels, flats, homes and barns; and even clothing, the little that remains on some of us, has disappeared. We are really back to nature; but let us see whether with the closeness to nature, we are happier, considering that all of our modern facilities are out of the picture.

From a distance someone is seen approaching. He is walking and climbing and now and then resting, as he sways along the narrow

*One of a Series of Popular Lectures given at the Philadelphia College of Pharmacy and Science, 1927-1928 Season.

rocky path. But suddenly the figure stops, and with our field glasses (for these we retain that we may see the picture), we observe a large, ugly, hairy creature, holding a heavy, broad stick in one hand and carrying some game on his shoulder. He rolls away a huge stone and from the cave, a few creatures similar in appearance to the one just described walked out. The meat is soon torn apart by the eager hands, and down it goes as quickly as it is removed. Finally one by one they all withdraw into the cave, leaving the remnants behind. Hunger is satisfied.

You will say this is not a pleasing picture. 'Tis true, but remember that this is primitive man. To sustain his existence, he found out that food was needed, and with his one track mind, he occupied himself nearly all day to get his food supply for that day.

THE FIRST REFRIGERATOR

With the cave dweller, it was not a question of doing today what can be done today, it was you must kill today if you wanted to eat today and live tomorrow. It was a pressing problem that faced him daily. But primitive man was soon forced to do something. He found that it was not always possible to get his daily supply. Weather conditions probably interfered then as they now do at times. Something had to be done. One day, however, when in distress and desperate for the want of food, he began to tear with his strong teeth upon the remains of some game which he had caught the day before. As remnants these were thrown away and were found later in a cold corner in the cave. To his surprise, he found that they were fit to eat, and that they possessed practically all the characteristics present when fresh. So here we have the first step in the process of the preservation of food, and in the natural coolness of the cave, we have the principle of refrigeration. It is perhaps here too that the story begins when discussing the conservation of food (the problem of storing food in plentiful times to be available in times of want);—yes 'tis even our first lesson in thrift.

In the progress of evolution, primitive man developed some process of reasoning, perhaps imagination, and may we not even call it a crude method of experimentation and research. Herbs, roots and other plant materials were tried for their ability to satisfy as foods. Here we have the beginning of a consideration of a variety in our daily rations, true not from a scientific standpoint, but in its own way, it has perhaps proven of value as the basis for the starting of a study of the scientific value of foodstuffs. And then the cave dweller, thinking,

in his own way, how to profit by his experience with the game, began to investigate in a crude way, the keeping qualities of these herbs and roots, etc., in the cool quarters of the cave. Gradually, we have a picture of primitive man improving his state of life.

Now, in this swiftly moving universe, where a year is but a day, and a century just a little while, we will pass by many of these centuries, for the picture concerning the preservation of food is about the same with but little improvement. And here we are looking at the ways of the people in ancient Rome, where splendor and even luxuries are known. We find that mortals are not bound to their own immediate environment to find and select their food supply, for transportation facilities are now available. It may be a line of slaves bearing a heavy burden (containing food to sustain life but delicacies as well), and compelled to move on by the stinging lash of a whip of an imperial soldier. It may even be some other crude method of transportation, bringing necessary food or perhaps snow and ice from the mountain tops and other available places, so that the Emperor may have a variety of foodstuffs and possibly artificial refrigeration to cool and even unknowingly to preserve these. The wheels of progress have moved on. Transportation has made more easily available a variety of foods. Artificial refrigeration is perhaps made available in that nature's ice is moved from one quarter to territories nearby, where it is not plentiful, and used there to cool drinks and possibly to preserve foodstuffs.

As we gaze through our glasses, we see the centuries moving on and what do we find as the big problem at all times? It is the need of food to satisfy the hunger of the poor and the appetites of the rich. It may be one of want or one of gluttony. The hunger instinct is a basic fundamental instinct. At this period of man's existence, the food question, one of satisfying this hunger, is not only the principal problem, but a most difficult one. There may have been times in all or some localities where the keeping of food was not a pressing problem, for it may have been always available in sufficient quantities to be eaten fresh. But when preservation was needed, cold temperatures supplied by the means briefly mentioned were employed.

Our picture leads us now to those glorious days preceding the Elizabethan period. We are on the verge of great changes in that the diet is more varied and the food eaten, if not more wholesome, is at least more palatable. Much concern was given to the seasoning of food with spices, but comparatively little improvement was noticed in

the use of other methods for the preservation of foodstuffs. In this age of spices, for the latter played an important part in the commerce and history of these days, there is the possibility that the use of these condiments not only served the purpose of bringing new and delicious flavors to our old dishes, making food in general more inviting, but that in some cases, there was an actual preservation of the food by the spices and condiments. Foods which could not keep well before the addition of the spices, seemed to be capable of standing about for longer periods of time. It may be, as is the case even today, that there was a slight decomposition of these foods, but the odor and taste were masked by the presence of the spices. Still there is also the possibility that some of the recipes were actually prevented from spoiling, and perhaps we have here the beginning of the legitimate preservation of foodstuffs by chemicals and drugs. This is of course only problematical, for scientific methods of study are not ready to appear in the picture.

BACON AND PRESERVATION

We now find ourselves viewing the intellectual and gastronomic glories of the Elizabethan period, and what does our picture inform us? Food again—yes, always food. Marked progress in the preservation of foodstuffs had not been made. Most desirable foods were perishable, decomposed readily and had to be eaten while fresh. Today's abundance was unable to give much towards tomorrow's supply. But at this time, we are privileged to record the first scientific study and research of the value of the cold of the snow as an agent to preserve food. History tells us that the great scholar, philosopher and scientist, Francis Bacon was a martyr to the cause of the preservation of foodstuffs. As a contributor to science, interested in civilization and in the health of all people, Bacon's curiosity was directed towards the problem of preserving food. It is said that on a snowy winter night, he was struck by the thought that the cold of the fluttering snowflakes, found clinging to his carriage (as he was riding along), might help to preserve foods. He immediately ordered the driver to stop, went out and bought a dressed fowl. This he packed tightly with snow. Due to the exposure both in obtaining the fowl and in performing the experiment, Bacon was seized with a severe cold, and died a few days later. Before death, it is said, he asked an attendant if the snow-stuffed fowl was keeping. This was Bacon's last contribution to science, and as we may view it now, having approached the beginning of scientific research in the preservation of foods.

If my story was one concerning the production of methods for cooling our foods and drinks, I might have mentioned history informs us that the Egyptians knew the secret of cooling by evaporation. They made natural ice just as the natives in many of the Asiatic and African countries make it today, and that is by leaving shallow trays of water exposed to the night winds. Alexander the Great dug trenches to store snow. Old formulas and recipes for frozen creams and ices are to be found in the writings of days gone by. But the cold obtained by these various natural means in olden times was mainly for the cooling of food and drinks. Preservation by these methods was practiced to a limited extend or not at all, and inasmuch as my story is about the "Preservation of Foods," I will only relate facts and data in which preservation is the purpose sought.

PILGRIM'S PROGRESS

We now approach the days covering the last three or four centuries. We will therefore direct our attention to the picture in this country. The Pilgrims had arrived and before long starvation stared them in the face. The Indians kept the men from hunting or stole what they could collect. Nature may have been unkind at times in the amount of food which was supplied, but greater losses were exacted due to the spoilage of foods that were collected. Something had to be done to insure an adequate food supply and keeping the spoilage down to minimum. The result was the underground cellar, a warehouse where food could be stored, better protected against theft and where the coolness of Nature's earth could preserve it. What we have here is however nothing more than the same principle which the cave man discovered.

And what does the picture show us in those pre-revolutionary days? What were the methods of preservation which they practiced? Most foods were still perishable, and were to be eaten before they spoiled. The underground coolness or the short duration of cold from icy waters were the means whereby cold was supplied as the preserving agent. The path of civilization had changed, everything was more inviting, living conditions had undergone a radical change; and foods were made more palatable, more eatable, the old dishes having new inviting odors and delicious flavors. But the all-important problem of food preservation had made but little progress. Now as we approach more recent days, we may find a picture which is perhaps more pleasing, but the underlying principle of preservation, the problem of keeping food from spoiling, is to be found in methods which depend upon

nature's coolness, just as we have it when first introduced by primitive man. These cooling conditions may have been in the cellar or the depths of the well or perhaps the old spring house, where cold water of the winding stream coming from the hillside springs in some far off land was imprisoned, even if only for a few moments, but long enough to supply to the enclosed environment a degree of coolness, that aided materially in the preservation of foodstuffs. Even in these modern days, the spring house may be found in rural districts, a spring house in which the cold may come from water supplied by a running stream or merely from the natural coolness of the earth, again the caveman system. Spring house and well facilities are adequate methods of refrigeration, but the use of such facilities are limited, and people in populated districts cannot use these as refrigerators. Our picture now is approaching our own days. People began to live in closer contact with each other. Towns and cities were born. Food was needed for their inhabitants, yes food in quantities that were not dreamed of before had to be transported and kept, quickly to be made available when needed. Something had to be done to preserve perishable foods. Necessity as the mother of invention, is now portrayed in this picture by those large sheds found in the colder parts of the country, where immense territories are filled with blocks of ice, stored there during the winter season and packed in sawdust, hay, etc.—and to be unpacked and shipped when wanted, during winter or summer. This is ice, cold water in packages, a crude but desirable key in the first step in modern refrigeration. 'Tis a means of having something available both winter and summer, so that a low temperature may be made available to preserve our perishable foods, which now, because of necessity, had to be kept longer, as it would take considerable time for their collection, transportation and distribution. Methods were devised so that individuals could store this ice and thereby receive the benefit of the cold which this imparted to any environment. So we see before us a simple device of a covered vessel holding the ice, surrounded by the foodstuffs, or the zinc-lined box insulated so as to retain the cold, and the many other types of old-fashioned ice chests. The water formed by the melting ice had to be emptied at frequent intervals. From the simple ice chest or container, an improved refrigerator was introduced. Here the ice and foodstuffs were kept in separate compartments of a cabinet usually covered with insulating material. The water was allowed to flow into a pipe attached to the ice compartment and then connected to a waste pipe. The foodstuffs did

not come in direct contact with the ice, but were kept fresh by the cold imparted by the latter. The size of these refrigerators varied from the small chest used in the home to those used by dealers in foodstuffs or in the old type cold storage plants, where foods were kept until the demand for them necessitates their removal.

ARTIFICIAL ICE As we follow the picture, we find, however, that natural ice had its limitations. It was not always possible to store sufficient quantities during the cold months to meet the demands for the whole year round. Nature did not work in harmony with the ice trust, for some winters were milder than others. Then one had to consider the expense involved in the matter of transporting this natural ice from the colder regions. This necessitated a study of the possibility of making ice artificially, so that a sufficient supply could always be at hand, and, if possible, at a reduced cost as compared with the natural product. There were many early workers in this field of science. In 1775, Dr. William Cullen invented the first machine which produced ice by purely mechanical means. He was followed by Vallance of France (1824), Perkins, an American living in England (1834) and Dr. John Gorrie of Florida, who in 1850 procured the first patent in this country for the practical process of manufacturing ice. Some eighty years ago, or to be exact, in 1850, we have Dr. Frederick Carré, a Frenchman, introducing the first apparatus (ammonia machine) for manufacturing ice artificially on a basis, making possible competition with the natural product. Soon other methods were perfected, including machines by Linde of Germany and David Boyle in this country, and thereafter we have introduced many new forms of apparatus which were improvements over the old. Artificial ice gradually replaced natural ice as the means of supplying the cold necessary for the preservation of food. In fact, today, with an actual sale of approximately fifty-seven million tons annually, there is almost three times as much artificial ice supplied in this country as compared with the natural product. We now come in direct contact with the fact, that science had taken a hand on a more elaborate scale in this vital problem. From now on, our picture will show that science is at all times directing the movements behind the methods which we employ in the preservation of foods. The relation of pure food to the prolongation of life, and the matter of its preservation and subsequent economy to us as made possible by science is very important and interesting reading, and something which is often overlooked by the

layman. Our picture may direct us to the practice of the many methods other than refrigeration that are after all methods of preservation. For chronological exactness, these should be mentioned at this time, but so as not to lose our trend of thought, may I complete the story of refrigeration before a review of the other methods are considered.

In this country the earliest record of delivery of ice to the home is in 1802. Three year slater, Frederick Tudor sent a shipload of natural ice from this country to the West Indies to help keep down the ravages of Yellow Fever.

In 1875, a cargo of meat frozen by a refrigeration machine arrived in England from this country, and the food was in a sound condition. In 1880, a successful voyage was accomplished by a refrigerator ship sailing from Australia and arriving in England, with the meat in a satisfactory condition. Refrigeration by machine, making it possible to control temperatures during storage at any desired degree in all weather and seasons, any place and any time was soon recognized as a commercial success. Its use was extended, so that any food could be subjected to the influence of the preservative action of cold even during transit. Can you realize the influence that cold storage and refrigerator transportation has had on the development of our food habits and even our whole social sytem? Can you realize the saving of energy, time, health and even life itself? I will leave this to your imagination, for my story will be a lengthy one even without showing you these beneficial results.

The real beginning of the manufacture of ice artificially so as to compete with the natural product and its finally reaching a point where it is gradually replacing the natural product was in 1890. The greatest shortage in the crop of natural ice that ever occurred in this country happened at this time. Mechanical refrigeration stepped in to care for this unusual shortage and since then the ice-making and refrigerating industry has rapidly developed. Today, in this country alone, we use yearly about fifty-seven million tons of ice.

If we turn our picture so as to observe the conditions in the home today, we will find that in place of the cellar, or spring house, or even the daily delivery of natural or artificial ice, the principle of machine refrigeration is employed by the electric refrigerators. These are icing units placed in any suitable cabinet and operated by plugging into the nearest electric outlet in your home, and of course being modern, your home is wired. The result is an uninterrupted service, a

temperature colder than that given by ice, and one which is uniform at all times, whether you are home or away for some length of time. Even if the cabinet or refrigerator is not insulated sufficiently, or it may be necessary to keep it in a place where the sun may reach it, the icing unit keeps its temperature uniform and at freezing temperatures. There is avoided the possibility of the cabinet becoming an incubator, as would be the case under such conditions if the ordinary refrigerator and ice box were used.

It will be impossible for me to continue or attempt to review the other methods of preservation without briefly mentioning the important facts concerning the value of foods, and the important causes of food spoilage and deterioration.

The Value of a Variety of Food

The scientific study of food has followed certain definite trends. As early as 1840 it was recognized that proteins, fats, carbohydrates, mineral matter and water were the component parts of food tissues. Continuously thereafter chemists were investigating constituents of food substances, and by 1895 Atwater and his associates in this country had examined and listed the chemical composition of most common foods. About this time, it became common to classify food substances wholely by their caloric value or the amount of energy that they would yield to the body when taken in and properly digested. The next two decades added to this fundamental knowledge the observations concerning those mysterious substances known as the vitamins, so that McCollum and Davis were able in 1915 to formulate a theory of adequate diet. At that time, they said that a diet must contain in addition to proteins, carbohydrates and fats for energy, inorganic salts for the building of the body and vitamins A and B necessary for the proper growth and development. Later additional vitamins became known, so that the alphabetical category includes A, B, C and D quite definitely established, and possibly vitamin X or E necessary for reproduction. When considering the value of any food today we take into account all of these various factors, and, as is obvious to almost any one with a fundamental knowledge of foods, no single substance provides all of the necessary elements for adequate nutrition. For instance, milk is, no doubt, the most satisfactory single article of food consumed by man, but milk or any other food is not a complete food when taken over a long period of time as the sole source of nutriment. One of the troubles with milk is that too much

bulk is required to satisfy the body's need. It contains 87 per cent. of water and 13 per cent. of dissolved substances; it happens to be rich in both calcium and phosphorus, whereas many vegetable foods are rather poor in these elements. Indeed, only the milk of animals and the leafy vegetables contain enough calcium to satisfy the needs of man.

If nature has provided a single and complete food, it still remains undiscovered or if such a food exists, the human body has not as yet been adapted to its use. It is, therefore, necessary to be supplied with many different kinds of food so as to obtain the many principles necessary for the body's need. You can therefore appreciate one of the main reasons for the necessity of a variety of foods.

There is no law of man or of nature that compels the thinking human being to limit himself to milk, wheat, oranges, nuts, or anything else in the food category. If he is really intelligent, he will want to make up his diet of a sufficient variety of foods to provide everything necessary for the proper development and stability of his tissues. He will want to satisfy the esthetics of his appetite and the limitations of his digestive apparatus. Investigations have shown that fresh fruits especially citrous fruits and certain raw vegetables (green leaves, sprouting grains, etc.) ought to be included in the diet, to provide adequate amounts of vitamin C. Scientific studies have shown that the proteins of the muscle of the liver and kidney are more valuable as a supplement to cereals and fats than are the proteins of milk. Indeed, it is not even certain that milk always provides an adequate amount of vitamine B, and it is known that various samples of milk differ as to their quantities of vitamins A and C, the latter and vitamins D and E even being absent altogether in some samples. Eggs contain everything necessary for the growth and maintenance of the body, but are poor in calcium and unbalanced in other food principles. On the other hand, oysters, clams and crabs contain all of the uncharacterized food substances, including iodin and vitamin C. And again we must take cognizance of the fact that we may not be necessarily satisfied to exist on foods just because they are more useful and more necessary than others. The longing for some foods not as nutritious may be at times just as imperious, just as urgent as the longing for a piece of bread and butter or a glass of milk, so that sometimes we may have to satisfy a hungry heart instead of a hungry stomach and perhaps at the expense of the latter. Remember there is also a growing consciousness that the luxuries of one person may actually be the

necessities of another. This hasty review is indicative of the importance of a varied diet for man.

Spoilage and Destruction of Food

Nearly all foods are subject to infestation by insect pests. Some of the latter may cause disease in man if they are consumed with food. Other non-disease producing parasites may impart an odor, so that the food becomes objectionable, and last but not least, there are parasites which perhaps we humans never see but they are about, always ready to devour or destroy that life-sustaining food, before it reaches our table. A book of several hundred pages can be written covering plant diseases alone, and our efforts in combating these. Millions and millions of dollars are spent annually to fight bugs, other insect pests and insidious diseases to which our crops and foods may have fallen victims. Can you realize that it is easier to get an appropriation of millions of dollars to fight the European cornborer, the Japanese beetle, red spiders or other pests attacking our plants, than it is to obtain a similar amount to prevent humans from contracting disease? And just because it is our food, which is being destroyed. One after another, our crop plants have fallen victims to insidious, infectious diseases, especially the so-called "mosaic maladies." Corn, cucumbers, cane fruits, lettuce, potato, tomato, spinach, and many of our flowers used for decorative and other purposes have all suffered. Other plants are not immune. Cornborers, Japanese beetles, red spiders, leaf hoppers and hosts of other destructive pests and destroying organisms are threatening the food supply of humans in their contention for the right to exist. Were it not for the methods instituted by scientists, insects and plant diseases would rob us of at least 50 per cent. and probably 60 per cent. of our crops. As it is, in spite of the present methods to control their ravages, plant diseases and insect pests are taking a toll of from 12 per cent. to fifteeen per cent. of all food which is raised. And how about the rat menace? Here alone we are losing annually, in this country, food, possessing a value of approximately one-quarter billion dollars. These diseases and pests, remaining beyond our reach or difficult at present to control are in reality a menace and a challenge to humanity. Scientific and technical skill, patience, constant application and a large supply of money are required to overcome these enemies that are constantly attacking our food. The public are but little concerned or do not realize these facts, for being less tangible enemies that threaten us, these invaders seem

too remote for most individuals to become annoyed or concerned about them.

Bacteria or products produced by bacteria are perhaps the greatest offenders, causing the spoilage of food. The yeasts, molds and many members of still lower forms of bacterial life play an important part in the changes taking place in foods, so that most methods for handling foods have been so developed today as to exclude these organisms or to prevent them from exerting their effect. Insect pests which attack foods cannot breed and bacteria which decompose the latter are prevented from developing and exerting their effect at the temperatures generally present in the ice box, refrigerator or cold storage. Foods at cold temperatures are therefore protected from decomposition as long as the temperature remains low. It is important to remember that these low temperatures do not kill the microorganisms (only after exposure for long periods of time), so that if originally present, they are always ready and capable of developing, if the temperature becomes favorable. It is therefore important to avoid outside contamination by keeping ice boxes and all refrigerating devices clean, dry, and well aerated, and always be assured that there is sufficient ice (if this is employed), and that there is no faulty construction in the refrigerator. Some foods exposed to air (in particular the oxygen in the air) may change in color, flavor or otherwise display a pronounced destructive effect, resulting in spoilage. It therefore may be necessary to keep such foods in covered containers and preferably in the cold, as changes by oxygen are greatly reduced at low temperatures. Light may effect some foods if the latter are exposed, but the amount of damage done is so small, that little is said about this form of spoilage. The remedy generally consists in keeping out the rays of light, using containers other than glass, and where the latter is the only convenient receptacle, tinted or dark-colored glass must be used. Water vapor coming from the humidity in the atmosphere hastens the decomposition of dried or dehydrated foods. High humidity will increase the spoilage of most all foods. Products that are injured by humid air should not be placed in cold storage without the protection of tightly covered or even hermetically sealed containers.

Other Preservation Methods

In a general way, cold and the temperature of storage have been mentioned as having a marked effect on most all kinds of food spoil-

age. Nature's cold, however, has but a limited use and then usually on a small scale and for short periods of time, for the uncertainty of weather conditions enhances the risk of spoilage. Artificial refrigeration made available anywhere at all times and even during transit has aided greatly in improving the health and happiness of all people. It is, however, important to mention at this time that there is a difference between the terms cold storage and refrigeration. The latter term is only used when freezing temperatures are employed. Cold storage is a general term and though it includes refrigeration, the temperature at which food is placed in cold storage varies and depends upon the nature of each product. Foods are well preserved by cold if placed in storage in the best condition, and kept at the lowest temperature that is not physically destructive to such food. It is on this account that in cold storage, different foods require different temperatures. Many varieties of fresh fruits will keep almost five times as long in the cold as compared with keeping qualities at room temperature, but some fruits and certain classes of foods cannot be kept for long periods of time at low temperatures, for even here nature's ripening process proceeds slowly. Other classes may even show decomposition over an extended period of time, particularly if the food was contaminated with micro-organisms, when first placed in storage. Altogether and from a broad standpoint, where efficient methods are used, artificial cold and refrigeration have proven to be a process of great benefit to mankind. The truth is that ice and refrigeration are vital agents required by modern civilization. If foods which are fit to eat when fresh, are stored in such sound condition at the proper low temperature and for the required length of time as may have been demonstrated by practical experience or experimentation, such foods will lose little of their flavor and the food values will remain practically unaltered. Do you realize that there is in constant use in this country during the year about 800,000,000 cubic feet of cold storage space? It is therefore unfortunate that prejudices exist against this method and even other efficient methods of food preservation. Such attitude is generally based on limited and unfortunate experiences, improper technique, or most frequently solely on ignorance.

We have been compelled to interrupt our picture, as we will at varying intervals from time to time, so that in expressing our thoughts and describing various parts in more detail we will understand, appreciate, and enjoy more fully the view.

DEHYDRATED FOODS

If we therefore return to the picture and review it again, we may observe that for untold centuries, other methods of preservation of food had been practiced. Other methods had to be employed so that food should be preserved, if possible, for longer periods of time, than could be possible by cold temperatures. Primitive man found that another means of adding to his food supply was by the drying process. The exact origin of this method is perhaps lost in antiquity. The Egyptians and Chinese undoubtedly practiced this process of preserving food. Figs, dates, dried grapes and raisins are mentioned in some of the oldest writings.

In this country, our picture shows the Indians drying meat and fish and some vegetables. The white man found the Indian using this method as a means of adding additional products to his meager food supply. The Colonists dried fruits and in fact established the food industry on a commercial basis when they began to dry codfish and market this product. It was perhaps not until the beginning of the Civil War that other desiccated foods were made available. Reports of these dehydrated products and especially dried vegetables are given in the army records.

It was not until after the Civil War that the dehydration of food on a commercial basis was extended to substances, other than fish. The fruit-drying industry on the Pacific Coast had its inception about this time.

The removal of water from foods by natural means, employing the beneficial effect of the sun, is perhaps the only method of the few practiced in those early days, which is used today almost unchanged, and even to a greatei extent than ever dreamed of then. Many modern methods of drying by artificial means are also employed today, inasmuch as sun drying cannot be practiced on many foods; and where used on a commercial scale, it is only practical, providing there is a long dry season without rainfall or humidity. Drying or dehydration is an effective means of preserving foods, and is employed in almost all classes of foods. It reduces the bulk and thereby simplifies the storing, handling and distribution of food. The effectiveness of dehydration is due to the fact that micro-organisms causing spoilage cannot exert their effects in the absence of moisture or water. Drying, therefore, if properly carried out, is a specific remedy against decom position by bacteria. If the latter are present or get in during pack ing, etc., and the dehydrated foods are brought in contact with moist

ure from the humidity in the air or some other source, decomposition may set in. Care must therefore be taken to keep such foods dry by proper protective means. Drying does not yield a product which is protected against the possibility of attack by insect pests. In fact insects are attracted more easily by some dehydrated foods. It is, therefore, important to cover or protect such foods and otherwise guard against insect infestation. One of the severest criticisms against dried fruits is the statement that the cell structure of foods is changed during dehydration and that when water is added, the food is not brought back to its original condition. Though some marked changes in cell structure may be produced in the dehydration of some foods, the advantages of this method are so numerous that such criticism can be disregarded. On this account, however, the drying methods that are most satisfactory or more frequently used are those in which the water is removed without affecting the food value of the product, which is so treated for preservation. There are many mechanical processes and artificial means of drying. Blasts of hot dry air, furnaces, steam kettles, vacuum and other special types of machinery may be used. The most satisfactory methods are those in which the foods are dried under a perfect regulation of temperature, humidity and rate of airflow. The important dehydrated products on the market today are most fruits, especially those rich in sugar, some flesh foods, vegetables, dairy products as dried milk and eggs, cereals, nuts, sugars, starches, grains, individual or in combination with condiments, eggs, etc., and all kinds of extracts used in the home for beverage purposes. There are many countries that would have never been able to use cow's milk and other foods, if it were not for this process of dehydration. Some of the dried foods may not be used in large quantities in our homes, because the same product may be available in large enough quantities when fresh. But in communities where not available and in commercial industries, these dried preparations are widely used. This is especially true of dried eggs and dried milk, employed in the diet of all in countries where these are not found in the fresh state, and they are also used extensively by bakers and confectioners. With dehydrated products, it is possible to have a satisfying breakfast or any meal in but a few minutes anywhere and any time. But little space is required for a package of pancake flour, dried eggs, dried milk, coffee or other beverage, etc., and you can quickly prepare some delicious pancakes, fried eggs, your favorite beverage, followed by a most pleasing dessert made from a dehydrated product.

The removal of water from foods producing a dehydrated product may be at times only incidental, and again we may employ a combination of drying and other preserving methods, as in the case of smoking, a process which is a partial dehydration combined with chemical preservation. Our picture may show where the art of preserving food by contact with the fumes from smoldering wood may have been accidentally discovered by the ancients. It may have been found that meat, left hanging near the fire, acquired a more pleasing flavor and the important property of remaining fit for consumption by man for a long period of time after such exposure. There are records available to show that this method has been used for many centuries. A separate building or stack has replaced the old house chimney, making possible the intensifying of the smoke. The chemicals present in the smoke, acetic acid, acetone, so called "creosote" compounds, etc., not only collect on the surface of the food treated, but may penetrate into the latter. These chemicals, possessing definite preserving properties, prevent bacteria from growing and exerting their effects. A quick artificial but poor method of smoking flesh food is to dip or paint the latter with a solution of pyrolignic acid at various intervals. The meats, etc., are then allowed to dry. Smoking as a method of food preservation is used only upon flesh foods, due to the fact that the flavor imparted to the latter by the smoke would not be tolerated in foods other than fish or meat.

Smoking of fish or meats may be combined with a salt treatment, so-called salt curing, or other modifications may be practiced in some localities where a particular flavor is sought. Smoked foods cannot be depended upon to keep for long periods of time. Other methods, as refrigeration, etc., are necessary, if one wants to prolong the period of preservation. In fact, it may be important to mention at this time that all dehydrated foods, powdered milk or eggs, fruits or vegetables are greatly benefited and are preserved for longer periods of time, if stored at low temperatures.

STERILIZED FOODS

Sterilization or complete destruction of bacterial life by heat is another method, which, as a means of preservation, is not only used in the household, but is practiced on a large scale commercially. The importance of heat as an effective weapon against the spoilage of foods was made possible by the researches of Pasteur. He not only showed the relationship of micro-organisms to disease and the decay of organic matter, but he in-

troduced the process of Pasteurization or heat sterilization as a means of destroying these offenders. The term sterilization is still employed when heat is used as a means of destroying micro-organisms. The term Pasteurization is used commercially only when a limited heat treatment is employed, with the object of not necessarily killing all germ life, but mainly to kill or render innocuous those organisms that produce disease. This process, described really as a form of partial sterilization, produces very little change in the food value of the food so treated, and will usually destroy many types of organisms that may be present and hasten the decomposition of the food. In 1860-64, Pasteur employed this process of Pasteurization in his investigations, which saved the wine industry of France and at the same time opened up the new field of Bacteriology. In 1886, the chemist Soxhlet advised the use of heated milk for infants. In 1890, we find Pasteurization employed on an extensive scale in this country in the treatment of milk, preparing it for marketable purposes. The value of this process, which as a public health measure is compulsory today in most large cities, cannot be overestimated. This method is applied in practice by placing milk in coils, suitable vats or container, subjecting it to a temperature of 145 degrees F., holding the milk at this temperature for twenty minutes and then rapidly cooling. The milk is then refrigerated and disposed of within a few days.

If any food is placed in a container, the latter stoppered with cotton and this then subjected for a sufficient length of time under the influence of heat, employing boiling water, steam, etc., a thoroughly sterilized product will be produced. The food will remain preserved indefinitely, even though the air is free at all times to pass back and forth through the cotton stopper. The outside tufts of the latter act as a filter, so that the bacteria in the air on the outside are retained, and the air passes through as sterile air. As long as the stopper is not removed, the food will not decompose, even though the temperature and humidity may vary and become excessive. The heat employed will not only kill disease-producing bacteria, but bacteria that cause spoilage, insects and their eggs, that may have found their way in; and in fact most agents causing decomposition are destroyed or their activity is arrested. It is therefore apparent that this is a most valuable method of preserving food. It is of course impossible to market or ship foodstuffs in containers stoppered with cotton, so that different containers and methods of sealing these were introduced.

CANNED FOOD Glass, non-porous earthenware and metal cans, usually made of tin plate, are most advantageously used as food containers. The word can was employed as an abbreviation of "canister," for canisters of tin plate, fashioned by hand, were used in the early days as containers. The process of preserving can and contents became known as "canning" and the finished preparation was marketed as "canned goods." Cans of "tinned food," as the English use the term, are found the world over today. Foods which are rare or unknown, or never available in a natural or uncanned state in some places, are now possible, and are distributed there.

As agents assisting in preserving foods, containers may be divided into three classes. First, we have those that are hermetically sealed. A hermetically sealed container may be defined as one which is thoroughly sealed and will show no visible leakage when placed under water. The choice between tin-plate and glass containers is dependent on factors other than their efficiency in preserving foods by this process, as both classes of material are suitable as containers to be sealed hermetically. In sealing food by this method, it is almost impossible to prevent sealing a certain amount of air in a container. There are some foods which will spoil even with this small amount of air present. The result has been in addition to simple hermetic sealing, foods are also hermetically sealed in a partial vacuum (the air in the container being withdrawn before sealing), and we also have hermetic sealing with inert gases. Gas packing is usually carried out by withdrawing all the air and allowing the vacuum thus formed to be filled by some pure, inert gas from a tank. The gas is nitrogen or usually carbon dioxide, which has in itself an ability of restraining the growth of some organisms, that cause spoilage.

The second class of containers used in preserving foods are those in which we do not have an absolute hermetic sealing. The latter is sacrificed to ease of opening. The lids, tops or covers are usually "screw tops" or "slip covers," etc. Containers sealed in this manner are inferior to hermetically sealed containers as aids in the preservation of the food present. They are therefore used only for foods, which do not require drastic means of preservation.

The third class of containers are those in which no attempt is made to have the lid airtight. As a container, it is merely better than paper or porous material and protects the contents from excessively dry or humid air.

The preservation of foods by placing them in hermetically sealed

containers and then subjecting them to the action of heat to destroy the agents causing spoilage was introduced by Appert, a French confectioner, in the early part of the nineteenth century. Though claims are made that Saddington, an Englishman, prepared foods by a similar method, Appert is considered the discoverer of this process, as records show that in 1810 he was granted patent rights on his process. Though practiced on a small scale, Appert's method was adopted and used not only in France but in England and other countries. In this country, Appert's method was introduced by William Underwood in 1821, and later in 1839 by Isaac Winslow. Only glass containers were used in the early days. The use of tin cans, or the beginning of canning as we know it today, was started by Pierre Angilbert in 1823. It was years later that the process was employed on a commercial scale. In 1839, Wright of Baltimore, packed oysters, and Treat of Eastport, Maine, packed salmon by this process.

Appert's method is practically the same procedure the housewife employs in the home in putting up vegetables, fruits, etc. With but little modification, the same process is employed commercially. You remember the process. You gather or buy the fruit or food, and then prepare them for cooking. They must be washed, hulled, or peeled, and in case of some fruit the stones are removed. These are then boiled—with or without sugar, as the case may be—care being taken to see that the fruit or the syrup does not burn. The jars or containers are washed well and heated in boiling water. They are then drained, the cooked food is poured in steaming hot and the top is fastened tight. The containers are then turned upside down, and after a few minutes, if leaks are not observed, the canned food is stored in a cool, dark place until needed. On a large scale, the finished product is usually placed in boiling water or under the influence of steam for a designated length of time as an additional precautionary measure, as this serves to sterilize the canned product. For better results, fractional sterilization should be used. In this method, the containers are given a second and even a third heating after intervals of twenty-four hours.

It is unfortunate that the average individual is prejudiced against all canned food except those put up at home. Possibly this is due to the fact that until recently, manufacturers refused to allow visitors through their factories. The real reason was that each manufacturer regarded his process as a secret, and the precautionary measure of no visitors was taken to guard against the disclosure of his secret. On

this account, rumors were heard that foods were handled in an unclean or careless manner at commercial plants.

The truth of the matter is that one wonders that the commercial development of canned foods survived at all, after one reads of the many failures and much spoilage in the old days. The outbreak of the Civil War opened a large market for canned foods. Defects were perhaps not noticed by the armies, as they would have been by housewives. Even if "swelled" cans were found, which contained foods that were far from desirable, complaints were useless and in days of war, poor food is looked upon by the hungry soldier as better than none. There is no doubt, however, that this condition developed a certain stigma to canned goods, so that it has taken over a half century to overcome it. On the other hand, the manufacturers were taught by this experience. You must also remember that Pasteur's epoch-making series of investigations were being carried on during the early sixties or about the same time that the war was on. Germs, methods of sterilization, effects of heat on tin containers, and other important data were not known, and until these facts were found out, it was impossible for any industry, requiring the answers to these questions, to make rapid advances.

The first improvement, which in reality gave an assurance that canning could be regarded as an established commercial process for treating foods on a large scale, was the introduction of steam under pressure as a means of sterilization. In the early seventies, it was found that sterilization could be made more effective and even accomplished in a shorter period of time, if the canned material was placed in strong iron chambers and subjected to the action of flowing steam under pressure. The rise of Bacteriology and Chemistry has made it possible to investigate all phases of this industry in a thorough manner. Science has replaced guesswork. Exact knowledge is taking the place of superstition and ignorance. Revolutionary changes in the manufacture and sealing of cans and other containers have taken place, so that mechanical perfection with scientific knowledge and control have brought the canning industry to an unassailable position, and a necessary and even indispensable adjunct to the other methods employed in the conservation of foods.

The canner of today can put up a product which in many ways is more satisfactory, than that which we can have put up at home. In the first place, only the best food is chosen after it is grown under his supervision in the most modern scientific way. The canning factory

is usually located in the district where the produce is grown, so that as little time as possible is allowed for spoilage of the food during transit. Upon arrival, the food is again sorted and sent to the cleaning machines. From here on, humans do not handle the food until after it is packed and sealed. Automatic machinery, which can be cleansed and sterilized by modern methods, lessens the possibility of contamination. Methods of sterilization are more exacting than those used in the home. Thorough inspection throughout the entire process will detect any missteps and leaks, so that the can and its contents will be rejected before it is sent out on market.

There are very few foods that cannot be canned. Wherever other cheaper or more convenient methods are not applicable, hermetic sealing is being used. Meats, fish, fruits and vegetables of all kinds, cereals, poultry, dairy products, soups, puddings, syrups, and all classes of food reach the consumer in canned form. When you think of the condensed soups and other combinations of foods in cans, where you may have 10, 20, 30, and even more ingredients, composed of vegetables, herbs, condiments and spices, diluted with beef or chicken broth, do you not appreciate the helpfulness of these products? Canning makes possible a variety of food all the year round, a variety which can be stored in cans during the time of the year when the particular food is plentiful, so that in reality the canned product also conserves what would otherwise spoil and go to waste. Their convenience and economy, their small bulk as compared to that of the raw products employed in making the finished preparation, and the fact that they are available anywhere, any time, are facts which make it necessary that canning must be considered in any study of human welfare, and be regarded as a boon to mankind, and an aid to the health of humans.

It may be unwise to give a general statement as to the keeping qualities of canned foods. At times the particular food in question must be considered individually. One may, however, state that foods, heat sterilized and hermetically sealed by our modern methods, will withstand spoilage for a reasonable length of time. Where convenient, refrigeration should be used, as this will prolong the period of preservation. As a method of preservation, the canning method is the most satisfactory of all methods.

The housewife frequently objects to cans, due to the corrosion or blackening of the can, and subsequent solution or suspension of the tin or iron, or the transference of the black residue in the food. At

times, there may even be an actual perforation of the can. The causes of these disorders have been investigated and are known today. Various remedies have lessened their occurrence. In some cases, more care in the technique, especially in the removal of oxygen, has remedied the situation. The use of cans lined with enamel, paper, gum, resin and other materials are also used. The reactions causing such damage usually require a long period of time, so that the contents of most canned goods are probably consumed, before any marked damage is apparent.

We may also hear occasionally from some sources, that the canned foods lack some of the necessary food accessories, and that some of the vitamines are destroyed during sterilization. As it is, these statements will require a considerable more amount of experimentation before they will be accepted as final. Most vitamines, present in acid mediums, are usually not affected by heating for the period of time as practiced during canning. Fruits, vegetables, etc., are acid and this statement applies to such foods when they are processed in canning. Practical evidence has, however, demonstrated that canned foods occupy a high place as nutrients for humans.

It would require days of continuous filming to attempt to show you the picture as we see it today, and the role preservation plays in the production of modern foods for the market. We can picture a steer, a hog or other animal, and follow him from his home pasture to the table, where he is introduced as a preserved food. Have you any idea of the variety of frozen, pickled, cured, or canned meats and their combinations that are available on the market? In like manner, pictures of fruits, vegetables and all products starting in with the crude or raw product and following them on through until they are placed on our tables as dehydrated, canned or other preserved types would not only make a valuable study, but they would be an interesting showing of the part played by science today in food engineering. Can you picture the hundreds of industries, the thousands of plants, the millions of people and the billions of dollars connected with the marketing of food made available by preservation?

Our picture may even introduce foods that keep well for long periods by chemical preservatives, chemicals which today are rather notorious and not allowed by most authorities as food preservatives. Before mention is made of the latter, for they are used in certain quarters, I will direct your attention to other chemicals which are harmless, or even have food value, and are employed as permissible preserva-

tives. These are salt, sugar, vinegar, and lactic acid, very frequently found as constituents in our diet, and on this account perhaps rarely thought of as chemical preservatives.

CHEMICAL PRESERVATIVES All sugars employed for sweetening foods, or even for their energy producing value, possess marked preservative properties, when used in sufficient quantities. Although cane sugar is most frequently employed, invert sugar as found in honey, glucose as found in many of the fruit juices, or any of the other sugars can be used. They will preserve any food, whether of animal or plant origin. But inasmuch, as we have to satisfy our taste, and the flavor and other aesthetic considerations play an important part, the use of sugars as preservatives are limited to certain foods of plant origin, especially the fruit class of foods. If a small degree of heat is used in the finished preparation containing the sugar, the yeasts and molds are generally killed. The food then placed in sterilized, tightly sealed containers will keep almost indefinitely. This is the basis of preservation used in the home and in industries, and in the production of jellies, jams, marmalades, preserves, candied and glaced fruits. In combination with berries and other crushed fruits, which are usually stored in the cold, there is also made available preparations of value in the ice cream, soda fountain supply, confectioners and baking industries.

In the preservation of milk, cane sugar finds a very extensive application in the production of the "condensed milk" on the market. This process was first tried by Newton in England in 1835. As an article of commerce, condensed milk dates back from 1856. The technique employed in preparing condensed milk is almost identical with that used in preparing jellies, etc. The milk is heated, poured into suitable vacuum pans, about 10 per cent. of cane sugar is added and the mixture is allowed to evaporate slowly at a low heat, until it is reduced to about one-quarter the original volume. It is then placed while hot in tin cans, and the latter are sealed. The yeasts and molds are generally killed by the heat treatment, while any other bacteria, if present, are prevented from multiplying or exerting their effect by the presence of the added sugar, present in the finished preparation in a concentration of approximately 40 per cent. to 42 per cent.

Canned milk, prepared in the same manner, but without added sugar (*i. e.*, unsweetened) is also prepared in large quantities and sold as "Evaporated Milk." High temperatures must be employed in

sterilizing the finished product, usually placed in cans, so as to be sure that all micro-organisms have been killed. As no sugar has been added to prevent the growth of bacteria that are present and usually not killed by the heat in the process of manufacture, drastic heat sterilization is necessary.

At present, most of the evaporated and condensed milk in this country require about one and one-half billion gallons of fresh milk, the bulk of which would otherwise go to waste. With the additional amount of milk required for that food and delicacy made possible by cold preservation (ice cream), can you appreciate that the animal industry and farmers must keep a few million cows in good health, just for the production of ice cream and condensed milk products?

It is to be noted that sugars in high concentration do not kill micro-organisms. They merely prevent the latter from growing or exerting their effect. Hermetically sealing or refrigeration of products so treated will serve as an added protection, and prolong the period of preservation.

Salt, a food in itself, yet not used alone, but employed at almost every meal with other food, has acted efficiently as a preservative for centuries, and is used for this purpose today more extensively than ever. If salt is present in foods in concentrations of 6 per cent. and preferably 7 per cent. or more, most foods will keep from spoiling. Its use as a preservative in such strengths is however restricted to foods, which will not be objectionable when used at the table, because of the taste imparted by the added salt. The principal use of the latter will therefore be found as a preservative in flesh foods, salad dressings, mustard, tomato products, catsup, chili sauces, and in the making of a brine, in which is placed olives and vegetables (especially tomatoes, cucumbers, cabbage, etc.) and other "pickle" and "relish" constituents.

Applying dry salt or a brine (solution containing from 20 per cent. to 25 per cent. of salt) to fresh meat or fish is referred to as "salt curing or salting." The dry method is more frequently used. Here, as the salt diffuses through the flesh, the water leaves the cells and coming to the surface, a natural brine is formed. Refrigeration will of course prolong the period of preservation of salt-cured meats or fish. For red meats, small quantities of saltpeter (potassium nitrate) are usually added. Though mainly used to bring out the red color, this chemical possesses slight antiseptic properties.

Cheese and butter have salt added to them, and its presence accounts to a great extent for the keeping qualities of these foods.

Another legitimate food preservative is vinegar. The active principle, acetic acid, is present in concentrations of from 3 per cent. to 6 per cent., and the preparation is generally marketed as cider, wine, malt, glucose or molasses vinegar. Any food product, containing acetic acid in strengths of 2½ per cent. or 3 per cent. or more, will keep almost indefinitely. Acetic acid and vinegar are primarily used in the process of pickling. Any vegetable food may be pickled and preserved by this process. The vegetables most commonly pickled are cucumbers, green tomatoes, peppers, onions, cabbage and cauliflower. Fruits may also be preserved by vinegar, but the pickling of this class of foods is but frequently attempted. However, mention might be made of the melon, which in Europe is pickled, and is a favorite dish. In some quarters, only the rind of the melon is pickled, and those of you who have tasted it know that it makes an excellent preserve. The term "pickling," as commonly used, refers to the preservation of food in solutions of salt, vinegar, or weak acids or other similar legitimate antiseptics, which may contain sugar and spices.

Vinegar, though feasible as a preservative for meats and fish, has never attained a wide use, and commercially it is only employed to a limited extent for this purpose. The only other food preparations, where vinegar may be employed conveniently as a preservative, are in salads, mustard, chili sauce and tomato products, where the high vinegar content (necessary to give a 2½ per cent. or 3 per cent. acetic acid preparation) would not be objectionable, because of the taste.

Just as the sugar glucose (present in fruit juices or formed from cane sugar) will produce alcohol, and, the latter after fermentation will yield acetic acid, so lactose or the sugar present in milk will yield an acid, lactic acid, after fermentation. In fact, when milk sours, this acid is produced. It is the acid present in most types of buttermilk, and due to its presence, such buttermilk remains naturally preserved. Lactic acid in concentrations of 1 per cent. or more has recently been found effective as a preservative in salads, egg preparations, etc. Like vinegar, it is harmless, and is to be regarded as a legitimate food preservative, having the advantages of possessing a more pleasing odor and taste. In all likelihood, we will hear more and more of lactic acid as an ingredient in our preserves and food products, as soon as scientific experimentation will give us more definite information than is available.

Some spices and certain fragrant herbs used for seasoning foods possess marked preservative properties. Cloves, due to the oil present is particularly effective, and is used for this property in combination with salt, vinegar or sugar in many of the dressings, catsup, sauces, etc. This spice, cinnamon, and others are legitimate condiments, which possess some antiseptic properties, and when present in foods prolong somewhat the period of preservation.

You have undoubtedly gathered by now the fact that the proper preservation involves not only the art of keeping foods fresh, so that they may possess their pleasing odor and taste, but that their nutritive value should remain unchanged, and nothing of an injurious character should develop or be produced during the period of preservation. All methods of preservation that have been considered thus far do not markedly affect the food or its nutritive property, and will not result in the introduction of added substances that may become injurious to man.

The simplest and cheapest way to preserve any food is to add a chemical preservative or antiseptic, which will retard the growth and development of bacteria. The term chemical preservative, as used here, is a chemical or drug not obtained from natural sources, which will not only retard the growth of micro-organisms, but may exert harmful effects when taken internally. This definition is given so as to differentiate such chemical preservatives from the natural, harmless and even useful preservatives, which are used as condiments, and act in the same way as the others. These are sugar, salt, vinegar, lactic acid, etc.

Prejudice against methods of preservation are due not only to ignorance, but also to the promiscuous, indifferent, and blind use of chemical antiseptics, without regard for the harmful effect to the consumer. Furthermore, food handlers, who are interested more in the immediate pecuniary consideration and not in the permanency of their business or in the health of the community, are apt to be too liberal in the use of such substances. What is more important is the fact, that these same chemical preservatives may be used to preserve foods, which were prepared from materials that are so decayed or spoiled, that such ingredients would never have been fit for consumption either due to their possible harmful effects or what is more likely, to the aesthetics involved.

There exists a general prejudice against the employment of any of these chemicals which may be truly classified as drugs. This is

rightfully so, not only for the reasons mentioned, but for the following objections which are raised:

(1) That if these drugs, even in small quantities are present in all foods, their accumulation may exercise a toxic effect on the system of the consumer.

(2) They may retard or disturb the proper functioning of the digestive processes and burden the waste eliminating organs of the body.

(3) To repeat again—some foods may have already undergone decomposition before the addition of the antiseptic. Such decomposition will thus not be apparent, while the food product itself, when consumed, will be unwholesome, even though the antiseptic is present.

The advocates of chemical preservation claim that the amounts of chemical employed are too small to be detrimental to health, and such substances simplify preservation methods, thus making our food supply larger and cheaper. It is true that each chemical substance must be considered by itself, and in relation to the specific foodstuff for which it is used. No sweeping generalization is therefore advisable against preservation by all chemicals. There are therefore some instances where chemicals that have proven to be harmless may be added in small amounts in some classes of foods. Where these are employed in foods placed on the market, it is best that their use should be regulated by restrictive food laws. It will thus be possible to make inspection of such plants so as to be assured that decayed ingredients are not being used in preparing the finished product, and that other sanitary precautions are observed.

A general, wide and promiscuous use of chemicals for preservation should be prohibited by law, not only for the reasons mentioned, but for the fact that more desirable and wholly unobjectionable methods of preservation have increased in their effectiveness, so that we have safer processes, which today are very cheap and more easily controlled. Moreover, the taste and odor of foods so preserved frequently warn us of their spoilage.

Though chemical antiseptics are used commercially but rarely today as food preservatives, it might be advisable to consider the properties of those which have been brought forward as harmless or least harmful. Mention will also be made of those that are not permissible as preservative but used at times illegitimately, most frequently to hide the inferiority of the food product.

Nitrates—The nitrates, usually sodium or potassium nitrate or saltpeter, are used mainly in foods made of animal flesh. It is but a weak preservative, and it is used primarily for the property it possesses of retaining and accentuating the red color of meat. It is harmless in the quantities ordinarily employed usually, ¼ of 1 per cent. When used to make stale meat look fresh, a fraud has been committed, and it is so regarded by sanitarians.

Benzoates and Salicylates—These substances are more efficient as antiseptics than boric acid and borates. They are water soluble and usually employed in food preparations that are of an acid character, so that, after their addition, free Benzoic and Salicylic acids are produced. Salicylic acid is condemned as a food preservative, and the objection is unanimous and well founded. Sodium Benzoate used in acid food preparations, producing Benzoic acid, has been a storm center around which the question of chemical preservatives has raged. No one would advocate the promiscuous use of sodium benzoate in all foodstuffs. It should not be used in foods which are consumed in large quantities so that the intake of the chemical will eventually be large, as when permitted to be used in tomato and other soups, cider, soft drinks, etc. But when limited to amounts which should not exceed 0.1 per cent., and employed in such small amounts in foods, which are used in small portions at a time, and therefore kept over long periods of time, there can be no serious objection from the standpoint of health. In fact, there is an added economic gain of preserving catsup, chili sauce, relishes, concentrated syrups and soda fountain fruit juices, until these products are all consumed. The main objection which is raised and requires careful watch and control is, to be sure that one is not using this chemical to preserve a food preparation made of decayed or undesirable ingredients. It is for this reason that products that do not contain benzoates or other chemicals have a much larger sale than similar preparations containing preservatives. Even the layman has realized that the keeping qualities of the latter are indicative of the freshness of the ingredients and care observed during the manufacture.

Boric Acid and Borax—These substances have been used in strengths varying from 0.05 per cent. to 0.1 per cent. as a preservative for milk, butter and other dairy products, broken eggs (sold as frozen eggs to bakers and confectioners), all fish and meat prepara-

tions, canned fruits and vegetables and other foods. They are usually the important ingredients present in so-called "food or canning preservatives," advertised or sold to the laity to be used during canning. Their use as preservatives in marketable food preparations is forbidden by law in most countries.

Sulphites, Sulphurous Acid and Sulphur Dioxide—Sulphur when ignited yields sulphur dioxide gas. When in solution in water, the latter yields sulphurous acid. In the form of its salts, especially sodium and calcium acid sulphites, a chemical preservative is available, so that when used in acid food preparations as fruit juices, etc., sulphurous acid is produced. These chemicals used in strengths from 0.1 per cent. to 0.5 per cent. are used more frequently as frauds perhaps, than any other chemical preservative. In addition to killing bacteria, molds and insects, when applied to dried fruits, it bleaches the latter, improving the appearance of the product, and also enables the manufacturer to add excessive amounts of water to increase the weight. Meat and other foods are also given a better appearance of freshness, though these chemicals are seldom used in meat products. Fruits used for "glaceing" and "candying" may be preserved by this method. It is used in making clear candy due to the property of hardening glucose, which is employed.

These chemicals, though they do not cause immediate symptoms even when used for an extended period of time, are nevertheless harmful. They are dangerous preservatives to employ, and it is best to regulate against their use, as other more efficient methods are available to obtain the desired results.

Peroxides and Hypochlorites—Solution of Hydrogen Peroxide or the peroxides of various metals, as Calcium or Magnesium, and solutions of the organic soluble chloramines and the soluble inorganic hypochlorides (especially sodium and potassium) are very effective preservatives. In very weak dilutions they can be used in the home for the preservation of wines, fruit juices and even for milk. The only objection which prevents their use commercially for marketable food preparations is the general objection to all chemical preservatives, that of abuse in their application and promiscuous use.

Formaldehyde—A solution of Formaldehyde gas, sold under the name of "formalin" and "preservaline," has been extensively em-

ployed in bygone days as a preservative of milk. It has also been used in frozen eggs and other foods, in strengths varying from .002 per cent. to .01 per cent. This chemical, though very efficient as a preservative, is the most objectionable from the standpoint of health. Its use as a food preservative is condemned and forbidden.

It might be advisable to mention other methods of preservation which have but a limited use. At the same time, I will list a few problems in the conservation of food which are of great importance. In fact, the line of demarcation between those problems which are purely ones of preservation or purely conservation is not as clear-cut as might be expected.

Attempts have been made for almost twenty-five years to utilize electricity for the destruction of bacteria. Evidence gathered to date reveals the fact that this method can be employed for the destruction of bacteria in milk. The keeping quality of the latter is excellent, the food value improved, and at no time is there a cooked taste apparent, when electricity is used.

Investigations are being successfully conducted to determine the necessary elements entering into the food supply of plant and animal material employed by humans as foods. You are all familiar with the treatment of soil to which is added various substances so that the end result may be a richer and more nutritious environment for the growing of our crops. You know the care taken as to the diet which is employed in feeding chickens, cows, etc., so that these may be fit for supplying better food products. Even oysters and other fish are being supplied with proper elements under specific conditions, so that as in the other cases, we may not only add to the total amount of such food present, but materially lengthen the period during which these may be available as foods. The prolongation of the duration of life of foods, so that they may still be eatable and nutritious, is after all the main object of preservation, and if this can be effected by desirable aids other than the use of cold, heat, sealing or by using legitimate chemicals, no objection can be raised by anyone. In fact, there is but little effort expended in these other directions, so that we may have a bigger and better supply of such foods and available over a longer period of time.

The injection of solutions of chemicals into the tissues of plants to stimulate their growth or kill disease-producing organisms and inoculating these plants against deadly bacterial diseases may be advantageously employed shortly, if the experiments which are being

conducted prove as highly successful as preliminary reports reveal. There may be other means of adding to the existing food supply. This world of ours has survived all sorts of notions and doctrines in customs and in matters of every-day life. Its instincts concerning the well-being and prolongation of the life of each one of us is deep-seated. Yet there is no instinct which is of such definite concern as is the craving for food, a varied number of foods, and the desire to have them available just when we want them and at a reasonable cost. This all is made possible by the methods of preservation described here. It is an understanding of the underlying facts as mentioned, which will enable the layman to partake more freely of all classes of foods—foods which may be preserved by methods that some are prejudiced against, because they are ignorant of the facts. There may also be the contention that some preservation methods lead to standardization and that individual effort may be destroyed by a continual popularity of tinned foods, etc. These objections are, however, made by those who lack imagination and refuse to observe the conditions as they actually are.

The facts are that more and more humans are eating better food, and a variety of foods, that would be impossible if our modern methods of preservation were not available. Many of our vegetables, fruits, meats, etc., would never have met each other or be used in such large quantities, if not for the canning or other industries employing preservation techniques.

You are all familiar with the many tempting foods peculiar to some part of the country or to certain countries. Many of these special foods are made available to all by methods of preservation. It is not even drawing our imaginations too far by stating that if we learn to eat internationally, we may have more enjoyment and even form a foundation for a more permanent peace on this earth. If we were to indulge more frequently in favorite and special foreign foods, made available to us by preservation methods, could we not learn to know people better? And truthfully when visiting their lands, could we not enjoy more fully our sojourn and develop a more complete understanding between ourselves? How much easier would conversation lend itself to our diplomats and all, over a dinner table, where the food which is served is being enjoyed by everyone—food, which made available by our modern methods, we could have trained ourselves to enjoy, even for a short period of time, so as to merely complete our mission.

Preservation methods have made possible a service to humanity which has aided greatly in the progress of civilization, with the result that more economy, better health and greater happiness have beeen made available than in previous days.

There are far too many individuals who deplore the increasing part that machinery and science play in our lives. This is all wrong. Surely the thinking man and woman cannot agree. We must make machinery finer and science even better, so that by the intelligent use of these we will be enabled to make our lives better, longer, deeper and richer. We will thus have more time for more ideal duties and in particular for that most ideal of occupations—the cultivation of the mind and soul.

SPONGE

ITS HISTORY IN MEDICINE WITH A BRIEF ACCOUNT OF ITS HABITS AND STRUCTURE[1]

By J. T. Lloyd, Ph. D.

THE RAPIDITY with which iodine and its compounds have recently sprung into prominence in therapy is apt to lead one to believe that the remedy is of modern introduction. Study of the literature, however, reveals that in many of its present day uses, iodine in combination is about as old as traditional medicine. True, the isolated chemical element was not known to the ancients, but preparations of sponge (its richest natural source) were known and dispensed in substance partly burned, or by extraction of the ash in solution. By either method a concentration of natural iodides and other salts in complex combinations was obtained.

Even before the beginning of the Christian era, when the civilization of Greece was at its zenith, sponge occupied a recognized place in medicine. More remarkable still, considering the lack of lenses for observing minute structures, they were even then classed in the animal kingdom. At least, about 320 B. C., Aristotle, "founder of zoology," and probably the first Greek to state that the earth must be a sphere, placed them among the animalcula.

In medicine the Greeks used sponge, both fresh and burned.

[1] Contributed to the Seventy-fifth Annual Convention of the American Pharmaceutical Association, St. Louis, Mo., 1927. Contributed by the Author.

According to Dioscorides,[2] Greek physician and author of a treatise on materia medica—

> "Fresh sponges, and those most free from oils, are helpful for wounds, and to check tumors. With water or vinegar, they bind up (literally, *glue together*) fresh wounds, while, cooked with honey, they join together old wounds. Old sponges are useless. But even these are of value in softening up callouses and separating ulcers that are growing together, if bound upon them, dry, with a linen cloth. Fresh sponges placed upon old ulcers full of corruption dry them up. They also check the flow of blood.
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> "Burned with vinegar, they are useful in inflammation of the eye; also where there is need of a detergent or astringent. But it is better to tincture the ashes with the remedies to be used for the eye. The ashes of sponges burned with pitch check the flowing of blood."—*Dioscorides, V: 138.*

If, as seems quite possible, the terms translated "tumor," referred to the disease known to us as goiter, our present day use of Spongia and its derivative, iodine, is traced back to the first or second century after Christ. It is also interesting to note that even so far back the tincture of burnt sponge was employed.

At the time Dioscorides lived in Greece, sponge seems to have been well established in Syriac medicine. The Syrian physicians used it much as did the Greeks and also employed it in diseases of the respiratory system. For this purpose, "The Syriac Book of Medicines," 200 or 300 A. D., directs—"burn a sponge in the fire and crush it in wine mixed with water and administer as a draught." Interesting comparisons may be made with the works of many modern authors, such as Felter, who more than fifteen hundred years later (1922) wrote of Spongia usta (tinctured burnt sponge), "Spongia is much employed as a remedy for laryngeal irritation, and it seems to have been remarkably effective in croup and croupal types of cough." Thus it may be seen that since the time of Dioscorides, although countless medical preparations have flourished and become forgotten, for some reason Spongia continues to hold its place in medicine.

Through the Middle Ages and well into the nineteenth century, Spongia usta occupied a place of prominence among the most important remedial agents of Europe. Sometimes the burned sponge was macerated in wine or vinegar, sometimes it was dispensed as a powder. The following quotation from Lewis's Materia Medica described the

[2] Translated and condensed by Miss Margaret Stewart, A. M.

method of burning sponges and also gives the most common uses of the preparation:

> "Burnt in a close, earthen vessel, till it becomes black and friable, it has been given in doses of a scruple against scrophulous complaints and cutaneous defedations; in which it has sometimes been of service, in virtue, probably, of its saline matter, the proportion of which, after the great reduction which the other matter of the sponge has suffered in the burning, is very large. By virtue of this saline matter also, the preparation, if ground in a brass mortar, corrodes so much of the metal as to contract a disagreeable taint, and sometimes an *emetic quality:*[8] hence the college expressly orders it to be powdered in a mortar of glass or marble."—*Lewis's Materia Medica, London, 1768.*

The belief that Spongia owed its medicinal virtues to ordinary "saline matter," ended in the failure of an attempt to substitute a mixture of alkali and charcoal. That this attempt to displace Spongia was a failure and so accepted before iodine or its compounds were known is evidenced by the following quotation from the Royal College of Physicians, London, 1809:

> "Burnt sponge appears practically to produce effects which no mixture of the alkali and charcoal does, especially in the removal of bronchocele; and it is therefore retained."

In 1812, Courtois, of Paris, while manufacturing soda discovered iodine in the mother liquors of kelp. This was followed by its detection in other marine plants as well as animals and led many physicians and pharmacists to conclude that to iodine alone the virtues of Spongia should be attributed.

The "Pharmacopœia," of which two editions were published in Boston, 1808 and 1828, "by authority of the Medical Societies and Colleges," recognized Spongia. The first edition of the United States Pharmacopœia, published in Boston in 1820, gave it a place. It was also made official in the second edition of the United States Pharmacopœia, published in Philadelphia in 1830, as well as in the single New York edition of the same date. In 1830 iodine and its compounds received their first official recognition, being mentioned in both the Philadelphia and New York issues. Following editions gave place to iodine, but failed to mention Spongia, which soon became almost

[8] The emetic quality mentioned by this and other authors may have been due to a compound of copper produced by contact of iodine with the brass mortar.

obsolete in the practice of many physicians. At the present time, however, there is an increasing demand for the pharmaceutical preparation Spongia.

Pharmaceutical Constituents of Spongia—John Uri Lloyd comments on the constituents of Spongia as follows:

> "Sponge contains a large amount of combined iodine, also bromine, phosphorus, sulphur, silica and other elements in unknown combinations. Whoever reasons concerning the action of compounds made up of such substances as unknown combinations of the elements that theoretically may be formulated into chloride of sodium, calcium sulphate, sodium iodide, magnesium and iron oxides, unknown sulphides, and phosphates reorganized from organic tissue and reconstructed by heat into complex organic bodies, presumes much in asserting that such combinations depend solely for their qualities upon a single substance that may by destructive chemical processes be isolated from the original product. The intermolecular constitution of burnt sponge is today unknown. The uses of this preparation by physicians who employ it in contradistinction to iodine or its definite artificial compounds, are accepted as logically applying to a structural something that must be very different from pure iodine or a single iodine compound."

That such inorganics as are present in Spongia (burnt sponge) though often considered practically inert, can under certain conditions exert a profound influence, is well illustrated in the following quotation from Dr. S. P. Kramer,[4] ex-president of the Cincinnati Academy of Medicine:

> "The reaction between lime and silica is very interesting and important. If one add a small quantity of lime water containing 1.4 per thousand of Calcium Hydroxide to a solution of colloidal silicic acid (containing .7 per cent.) a jelly is immediately formed. This is probably an adsorption compound and not a true chemical compound. The amount of lime adsorbed varies very greatly and if one keeps on pouring water over such a jelly, an increasing amount of lime is taken up.
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> "This calcium silicate or adsorption compound is exceedingly toxic. Thus an amount of this jelly solution containing 5 mg. (.077 grain) of calcium silicate when injected into the jugular vein will immediately kill a rabbit weighing 1500 grammes (23,148 grains). When this jelly is examined under the ultra-

[4] Read and illustrated with specimens, before the Cincinnati Research Society, February 1, 1917.

microscope it is seen to be made up of amorphous clumps much larger than the minute particles that are found in the colloidal solution of silicic acid.

"If to a solution of sodium silicate there be added lime water, instead of colloidal jelly there is formed a definite aggregate or precipitate of calcium silicate. This form is not at all toxic. One may inject 100 mg. (1.5 grains) of this form of calcium silicate into the jugular vein of an animal without producing any effect whatsoever."

On the Habits of Sponges—Sponges occur in all oceans, in fresh-water lakes, ponds and rivers of all continents. In the ocean they are found from tidewater to the greatest known depths. The deep water Hexactinellida, whose delicate siliceous skeletons are objects of such marvelous beauty, do not reach their maximum numbers until a depth of more than one thousand fathoms (more than a mile) is passed.

Reproduction among sponges is accomplished by three distinct methods. The simplest of these, "budding," takes place in nature when a portion becomes broken from the sponge colony and starts life as a separate individual, much as a branch broken from a willow tree may take root and grow into a separate tree. This form of reproduction by fragments of the colony is now being used to serve the commercial interests of the sponge fisheries. For this purpose living sponges of the most desired kinds are cut into fragments, which are planted on the sponge beds, where they grow into mature sponges. This is the only manner by which the depleted sponge beds can be replenished by man. By this method seven years are required to develop a sponge of commercial size.

Sexual reproduction is the most usual mode of natural reproduction. The young sponge, or larva, developed by the union of the two sex elements, is a minute creature which swims free in the ocean, feebly propelled by minute vibrating hair-like processes, termed cilia. The larva resembles the parents so little that no flight of the imagination could conceive of their relationship. After a period of free life, the larval sponge, if fortunate enough to settle on some solid support, becomes fastened and completely alters into the well-known adult form. After once becoming sessile, it is never again capable of moving from place to place. Probably the larva's own power of locomotion could carry it but a short distance from its place of birth. However, when one considers that some ocean streams move almost a hundred miles in a day, the wide distribution of sponges can be readily comprehended.

The third form of reproduction is found among the fresh water sponges, and perhaps a few marine species. It is termed "gemmulation," and is a provision Nature makes in many of the lower plants and animals that live in environments which undergo radical changes, such as drying or freezing. The gemmules are egg-like bodies which ordinarily form in the body of the parent when its environment starts to change. Unlike true eggs, the gemmules are multi-celled and development does not require the union of sexual elements. Each gemmule is surrounded by a hard shell and can withstand freezing temperatures or long periods of dessication in hot sunshine. It is largely through the agency of gemmules or "winter eggs" that the repopulation of temporary pools formed by the freshets of springtime takes place.

For the most part sponges show but little preference for the nature of the support on which they spend their lives. Any enduring hard object, washed by fresh, clear currents will do. There are, however, a few species which have become dependent upon other organisms for their existence. Conspicuous among these are the small sponges that tunnel in the shell of oysters and other mollusca, and one species that is found nowhere except on the backs and legs of certain crabs. The first of these finds protection in the oyster shell, doing little or no harm to its host, while the other in return for transportation offers an effectual, portable hiding place to the crab.

Sponges are now quite generally regarded as animals, although until a generation or so ago most people, with the possible exception of the ancient Greeks, thought they were marine plants. Some scientists of the past generation, though unwilling to separate them from the vegetable kingdom, perceived that they had many of the characteristics of animals. To these men they were known as zoophytes or animal-plants.

Before the microscope made observation of minute protoplasmic structure possible, it is remarkable that even the most critical observers should have even suspected the animal nature of these collapsible masses of felt-like fiber. Motion, the popular distinguishing character for separating plants from animals, is entirely lacking or limited to the power of contraction possessed by certain species. Even this contractile power is less than the movement of some sensitive plants. Lacking, as they do, all perceptible organs, it is, as remarked by Dr. Sollars, "by negative characters that sponges may most easily be recognized."

In form there is wide variation among the different species. While some maintain a fair degree of adherence to a general type, others are profoundly influenced by the contour of environment. Some species spread over or around their supports, while others grow upward in stemmed cups or branched bunches of finger-like stalks. Some, like the bath sponge, approximate spheres, while others assume forms of the greatest variety.

The supporting skeleton of sponges is composed of calcium or silica, or like the bath sponge, an elastic felt-like network of spongin, an organic material akin to silk. Some have siliceous spicules cemented with spongin, while in a few the skeleton is entirely absent. The calcium and silica of sponges is formed into spicules, often having beautiful and complicated forms.

For present purposes a sponge may be likened to a thick walled vase, with its entire surface perforated by small holes leading into its interior cavity. Of course, only a few sponges are this simple. More complex canal systems are the rule, but these are formed by the union of many of the vase-like systems. In life, the never-ceasing lashing of minute, delicate, protoplasmic threads, termed flagellæ, scattered over the lining of the channels, keep up a constant flow of water. The current always enters the many small, incurrent canals and leaves by the large excurrent channel, corresponding to the mouth of the vase. In passing it bathes the epithelial lining of the sponge with an ever fresh respiratory current. It carries in food material in the form of minute, organic particles, and also eliminates waste. It supplies the inorganics which the protoplasm extracts with a nicety that is unparalleled by the most delicate methods that man has invented. According to Professor Sollars, "The quantity of silica present in solution in sea water is exceedingly small, amounting to about one and one-half parts in one hundred thousand. Hence it would appear that for the formation of one ounce of spicule, at least one ton of sea water must come in contact with the body of the sponge. Obviously from such a weak solution the deposit of silica will not occur from ordinary physical agencies, it requires the unexplained action of living organisms." It is probable that the accumulation of shells thus formed is responsible for the deposits of certain siliceous rocks. While many different marine animals have left their remains in these deposits, sponges, according to Professor Geikie, "appear to have mainly contributed to the formation of the important accumulations of flint and chert." Speaking on the same subject, Professor Sollars says, "This

may account for the fact that deposits of flint and chert are always associated with organic remains, such as Sponges and Radiolaria. By some process, the details of which are not yet understood, the silica of the skeleton passes into solution. In calcareous deposits, a replacement of the carbonate of lime by the silica takes place so that in case of chalk the shells of Foraminifera are converted into a siliceous chalk. Thus a siliceous chalk is the first stage in the formation of flint."

In medicine, calcareous and siliceous sponges have never found a place. Only the felt-like sponges, such as the familiar bath sponge, have been employed. These have skeletons of spongin, which is remarkable for its large content of iodine. In some tropical species, according to published reports, the iodine content may run as high as 8 to 14 per cent., while seaweed from which commercial iodine is obtained does not exceed 1.5 per cent. If, as estimated by Stanford in Thorpe's Dictionary, the water of the Atlantic Ocean contains only one part of iodine in 280,000,000 parts, each pound of these sponges must contain the total iodine content of almost forty million pounds of water. That this enormous amount of water could be circulated by the delicate flagellæ seems beyond the limits of reason. It has been suggested by John Uri Lloyd that the abstraction of iodine from the water may form an "iodine vacuum," so to speak, which is filled by the inrush of iodine extending from afar into the surrounding water. Thus the iodine may be depleted from water far from that which touches the sponge. Another theoretical explanation is the possible increased iodine content of water in the localities where sponges grow by the disintegration of the remains of kelp, sponges and other marine plants and animals. Or, it may be that sponges do not themselves abstract iodine from the water, but obtain it from the organisms they consume as food. Perhaps plants alone possess the power of abstracting iodine from the sea. Whatever the explanation, it seems beyond comprehension to understand the power of these animals to abstract such quantities of iodine or silica from the dilute sea water solution.

THE ALKALOIDS OF CEANOTHUS AMERICANUS. II

Extraction of the Alkaloid

By A. H. Clark

IN THE PREVIOUS paper* methods of extraction were described and the seemingly difficult removal of the alkaloid pointed out. Numerous attempts have been made to improve the extraction process. In all these the suspicion, previously expressed, that the alkaloid is slow to extract with organic solvents has been strengthened. In one case a lot of drug was extracted for four days with alcohol and still the alkaloid was not all removed although alcohol seems to be the best solvent for the mixed alkaloid after removal.

Considerable attention has been given to extraction with petroleum ether. The extract obtained is interesting and something is said about it below. The removal of the fat-like material should aid in the further extraction of the drug and certainly the absence of this fatty matter facilitates the removal of the alkaloid from the residues subsequently obtained. More attention has been given to the extracts obtained with alcohol since its use is much more convenient than ether. Numerous lots of crude alkaloid have been obtained by simple extraction with alcohol and also by continuous extraction in the author's apparatus.†

In both cases this has been done with and without previous extraction with petroleum ether. Extracts have been obtained from the alkaline (drug moistened with lime, sodium carbonate, sodium hydroxide, ammonia, etc.) drug by percolation or continuous extraction with alcohol and also acetone. In all cases no marked improvement in the yield or quality of the alkaloid has been secured. Two points of interest have been developed in connection with the removal of the alkaloid from the crude extracts.

First: the use of tartaric acid in place of acetic acid as previously used has some decided advantages. The alkaloid seems fully as soluble, there is less danger of decomposition of or reaction with the alkaloid, and the alkaloid is more easily removed from the mixtures obtained, or solutions of them in alcohol, than it is when acetic acid is used. Secondly: it has been found that practically all extractive,

*This JOURNAL, 98, 3, March, 1926, 147-156.
†*J. I. E. C.*, 19, 4, April, 1927, 534-535.

except alkaloid and the so-called resin, can be removed from an alcoholic extract by the simple addition of alcoholic potassium hydroxide until the mixture is just alkaline to litmus. A very abundant flocculent precipitate forms and frequently can be filtered off with little or no trouble. Frequently the addition of a very small amount of water causes this precipitate to form a compact gummy mass and the alcoholic liquid is readily decanted. The alcoholic liquid is yellowish and the excess of alkali can be readily removed by the addition of tartaric acid. After filtering, the alcohol can be removed by evaporation and a residue is obtained from which a crude alkaloid is easily recovered and is quite free from coloring matter or extractive. This procedure removes the chief objection to the use of alcohol as a solvent for extracting the drug.

The Alkaloids

No marked progress has been made in the study of the alkaloids. The product has always been about the same as previously described no matter how obtained. Another lot of crystalline alkaloid has been prepared, however. The crude alkaloid obtained from several extractions was combined and treated with a small amount of pure acetone. The acetone solution was filtered off and another portion of acetone added. This process was continued until the entire quantity of crude alkaloid was dissolved. Each fraction was kept separately and after evaporation of the acetone the melting points of the different residues was found to rise steadily, the last two or three melting close to 250 degrees C. These were dissolved in hot normal butyl alcohol and a crop of crystals obtained which were identical with those described in the previous paper. By concentration of the mother liquor a second crop of crystals resulted. These were identical with the others except the melting point, which was 260-263 degrees C., whereas the original lot melted at 255 degrees C.

Salt of the Alkaloid

Most any diluted acid dissolves the amorphous alkaloid, but salts have not been obtained from such solutions. Salts have been obtained by adding to solutions of the alkaloid in anhydrous ether a solution of the acid in ether, or in the case of hydrogen chloride by bubbling the dry gas through the ethereal solution of alkaloid. If water is excluded the salts are obtained as friable powders. If a trace of water is pres-

ent the salts are quite gummy, but dry out in a dessicator and may be readily powdered. In this way chloride, phosphate, oxalate, sulphate, and tartrate have all been prepared. These salts are all freely soluble in water and the solutions are distinctly acid. They are probably mixed salts of the various amorphous alkaloids, although several lots of chloride have been prepared and the melting point has invariably been between 255 degrees and 260 degrees C. no matter what sample of alkaloid is used. The chloride seems to decompose just above the melting point or at about 260 degrees C. The salts are usually colored, the color varying from straw-colored chlorides to dark brown sulphate. The sulphate darkens on standing. Time did not permit of extended analysis of these salts, but it is hoped that from some one of them a pure alkaloid may be obtained.

The Petroleum Ether Extract

The fatty material obtained absorbs iodine and has a saponification value of 136 for one lot and 155 for another. Along with this fat is obtained and an interesting non-alkaloidal substance melting sharply at 175 degrees C.

Tannin

A very pure "gallo-tannic" acid has been obtained. It is insoluble in the ordinary organic solvents, sparingly soluble in cold water but very soluble in hot water. It crystallizes from hot water in needle-like crystals which melt with decomposition above 220 degrees C. This substance reduced Fehling's solution, silver nitrate, gold, and platinum solutions and gives a precipitate with iodine solution and phosphomolybdic acid the latter accompanied with a deep blue color. It precipitates lead acetate solution the mixture becoming red upon adding sodium hydroxide solution. Ferric chloride gives a beautiful purple color, very permanent and becoming more intense upon standing.

Acknowledgment

The advice of Prof. C. C. Glover, of the University of Michigan College of Pharmacy, and the liberal supply of ground drug furnished by Flint, Eaton & Company, of Decatur, Illinois, are gratefully acknowledged.

SOME PRELIMINARY OBSERVATIONS ON THE COLORING MATTER OF CITRUS JUICES

By M. B. Matlack*

ON EXAMINING orange juice which has been squeezed into a glass and allowed to stand, it can be seen that the suspended matter settles out and carries most of the coloring material with it. This material varies from a pure lemon yellow to orange color, depending on the variety of orange used and the maturity of the fruit. With other members of the Citrus group the color varies from nearly colorless in the lemon and lime through yellow to orange and finally to red in the case of the Indian red pummelo. The supernatant liquid in all cases except one (blood orange) is a light straw color. This liquid contains very little coloring matter. However, the small amount of pigment present deepens slightly and changes to a greenish shade on the addition of alkali.

The juice of the orange is contained in small juice sacs. These juice sacs are not simply little bags but are cellular in structure. In the case of the fruits with colored pulp, these cells contain chromoplasts. Those with colorless pulp (or almost colorless pulp) contain what appear like groups of oily droplets or possibly elaidoplasts.

The pulp of the common round orange or sweet orange is nearly a pure yellow as is also that of the three varieties of kumquat (marumi, nagami and miewa). That of the satsuma, tangerine, mandarin (slightly lighter), calamondin, rangpur lime, and Sampson tangelo is deep orange red. The Indian red pummelo has red pulp and the pink grape fruit pink. The pulp of the following is practically colorless: lime, lemon, bitter orange, grape fruit, Siamese pummelo and citron.

The chromoplasts all give the usual carotinoid reactions and bleach readily on exposure to air or more quickly by the use of hydrogen peroxide. It can be safely said that they are colored by carotinoid pigments. In the case of the Indian red pummelo and the pink grape fruit the plastids were not quite so distinct, but there was a pink stroma which appeared in some cases to contain purple crystals.

On subjecting the last two above-mentioned fruits to the microcrystallization method of Molisch [1] an abundance of small purple crys-

*Department of Pharmacy, University of Wisconsin.

[1] *Ber. d. deut. bot. Ges.*, 14, 18-29 (1896).

tals was obtained in the case of the red pummelo and a smaller number of the same kind in the case of the pink grape fruit. These crystals matched in shape and color those obtained from the tomato. They were insoluble in phenol glycerin reagent and were not turned blue by 70 per cent. sulphuric acid. A solution of these crystals in carbon disulphide matched exactly in color a similar solution obtained from the tomato. This was true of both concentrated and dilute solutions. With the phase test between carbon disulphide and 85 per cent. alcohol, the alcohol layer was only very faintly colored. It would appear from these observations that the principal pigment of the Indian red pummelo and that of the pink grape fruit is lycopin.

The pulp of the sweet orange, likewise that of the satsuma and the king mandarin, was also subjected to the Molisch microcrystallization method. The results were not quite so definite. The king mandarin gave crystals which appeared very much as those usually ascribed to carotin. The satsuma gave spharites and filaments appearing very much like osazone crystals of the sugars. In only one case were crystals obtained from the sweet orange and these appeared to be in small bundles. All of these crystals appeared yellow to yellow-brown. It is thought that some unsaponifiable compound influenced the shape in which the color separated out. An unsaponifiable substance with a M. P. of 75 degrees C. has been found by the writer to be present.

Some of the pulp of the orange was dried and extracted with ether, the ether evaporated and the residue saponified. The soaps were extracted with ether, the ether evaporated and the residue taken up with petroleum ether. A portion of the petroleum ether solution thus obtained was subjected to the phase test with 85 per cent. methyl alcohol. Two layers of about equal color intensity were obtained. Repeated extraction with 85 per cent. methyl alcohol did not remove the remainder of the color from the petroleum ether layer. A second portion of the petroleum ether solution was evaporated, the residue dissolved in carbon disulphide and subjected to the Tswett [2] method of chromatogenic analysis. Part of the coloring matter passed through unadsorbed by the calcium carbonate. While still in the calcium carbonate it appeared somewhat of a rose color. The adsorbed coloring

[2] *Ibid.*, 24, 316-323 (1906).

matter formed a band near the top of the calcium carbonate column and appeared as a yellow to brownish-yellow band. On continued washing with carbon disulphide this band appeared to separate into minor bands.

Pulp of the tangerine treated in like manner and subjected to the Tswett method showed only a very faint band due to adsorbed material. Almost all of the color passed through unadsorbed.

Spectrographs were made of the material as extracted from the dried pulp of the last two mentioned fruits. Three bands were obtained which appeared to have the same position as those obtained from a known carotin extract photographed on the same plate. There was great absorption in the violet in the case of the two unknown solutions. The same trouble was encountered by Schunck [3] in a study of the coloring matter of the orange peel. This appears to be due to a water-soluble pigment which is slightly soluble in the solvents used.

Solutions of the pulp pigment in alcohol which had been carefully separated (after saponification) by the petroleum ether-methyl alcohol phase method were examined by the aid of a direct reading Hilger spectroscope belonging to the botany department and the position of the edge of the first band nearest the red end of the spectrum was measured. The average of six readings were:

Alcoholic solution of pigment from petroleum ether layer,	490.8
Alcoholic solution of pigment from methyl alcohol layer,	486.1

The thickness of the layer was approximately 10 mm.

	10 mm.	*5 mm.*
Carotin according to Willstatter and Stoll,[4]	492.0	492.0
Carotin according to Kohl,[4]	490.0	
Xanthophyll according to Willstatter and Stoll,	488.	484.0

From these observations it would appear that the pigments of the orange and the tangerine were carotin and xanthophyll. The ratio of the two pigments to each other determining the color which the pulp presents. This is probably also true of other members of the Citrus genus which have like colored pulp. The reason for the bands from

[3] *Proc. Roy. Soc. London*, 72, 165-176 (1903).
[4] From Plamer, "Carotinoids and Related Pigments" (1922).

the solution of the color of the sweet orange pulp in the case of the spectograph appearing to have the same position as those of carotin was probably due to more rapid oxidation of the xanthophyll present leaving the carotin in excess. The material for these observations had been kept for some time. The solutions used in the direct reading measurements were freshly made from new material. Trouble was also observed here in regard to too much absorption in the violet end of the spectrum. It is hoped to remove this so that the position of all three bands can be measured.

Experiments are now under way on large quantities of the peel and on the pulp and it is hoped that sufficient material for the isolation of the pigments in quantity will be obtained.

This preliminary investigation was begun at the University of Florida and continued during the past summer session at the University of Wisconsin.

SUCROSE vs. GLUCOSE

By Henry Leffmann

THE APPLICATION of science to the preparation of food and to the manufacture of new forms has given rise to some trouble in the official regulation of the sale of foods. Butter substitutes were among the first to be dealt with, and after the enactment of some drastic state laws, a Federal act is now operative, requiring stamping of each package and conspicuous signs in every place where the article is sold, together with heavy tax on any substitute artificially colored. Notwithstanding this fair arrangement, the manufacturers of oleomargarine are still agitating for relaxation of control, but so far owing to the opposition of farmers the proposition has a hard road to travel.

A second attempt to secure the free sale of an artificial food is now in full swing and there is great danger that it may succeed, for it has the farming interest rather with it than against it. By comparatively simple means starch can be converted into a carbohydrate resembling sugar, derived from the cane, beet or sorghum. The artificial sugar is called glucose by the chemist but favorable legisla-

tion already secured has permitted the term "corn syrup." It is now sought to allow its sale without any qualification, that is, simply as sugar.

The interests favorable to the effacement of the distinction between sucrose and glucose appeal largely to the profit that the farmer will secure from the increased use of cereals, especially maize. The differences between the two substances are minimized in every possible way, and a sort of smoke screen is thrown about the affair by giving emphasis to the similarity in nutritive value. The real point is that common sugar is but little used as a true food, but as a condiment, that is, for its sweetness. In the major part of the meal, comprising the real nutritive ingredients such as soups, meats and vegetables, sugar does not appear. It is used in connection with the beverages and the desserts, which are merely articles to tickle the palate and stimulate the jaded appetite to further table enjoyments. Sucrose and glucose are carbohydrates, but the real carbohydrate diet is starch, which is found in abundance in the cereals, especially in bread and in potatoes.

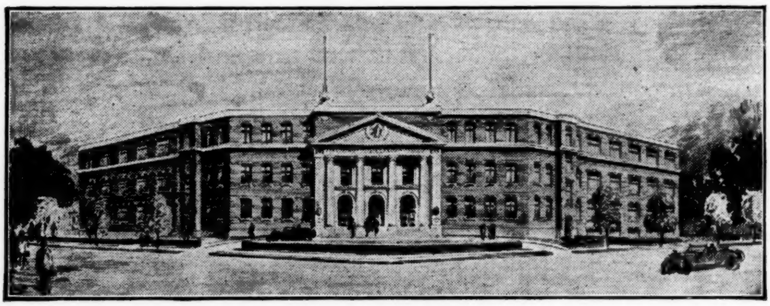
It is evident that any substitute for common sugar should be as applicable as it is to the sweetening of beverages and desserts, but glucose does not come up to this requirement. It is distinctly less sweet than common sugar, and its use as a sweetener will lead to excess in the carbohydrate diet, without the knowledge of the eater, who will have to add the substance until the proper degree of sweetness is obtained.

The same principle applies to candies, the manufacture of which in this country consumes so large a part of our sugar importation. Candies are not considered as foods nor used as such. They are eaten for their flavor and sweetness, and, therefore, the use of any substance that has a lower degree of sweetening is an unfair substitution, unless full notice is given.

There will be but little objection to the use of glucose in many ways, if clear notice is given of its presence, but the effort to permit it to masquerade without restriction as real sugar is to encourage fraud.

DEDICATION OF THE NEW BUILDINGS
of the
PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE
ONE HUNDRED AND SEVENTH FOUNDER'S DAY
February 23, 1928

ON THE AFTERNOON of February 23d, 1928, in the new Philadelphia College of Pharmacy and Science at Forty-third Street and Kingsessing Avenue, Philadelphia, a vast gathering of friends of the College came together to dedicate to the service of humanity the beautiful new buildings just completed. It is to the eternal credit of a small group of staunch men and women, Alumni of the



New College Building

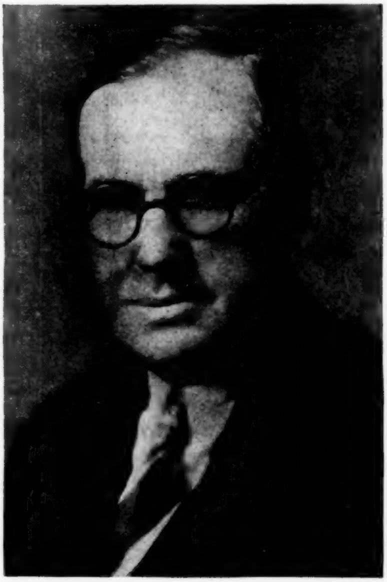
Institution, that this achievement has come to pass—and the patient, tireless efforts exhibited by this group found a fitting climax in these exercises symbolizing the accomplishment of their long task.

One hundred and seven years ago, to the very day, pharmaceutical education in America had been initiated at historic Carpenter's Hall by another small group—mostly Friends—and in a very modest way.

What, pray, would be the feelings of this little band of men "who builded better than they knew"—could they but see the College of today, that rises in beauty and dignity out in West Philadelphia across the river, and miles from where, in 1821, the city limits ended?

The dedication ceremonies were threefold in plan. At 4 P. M. February 23d, Dr. Wilmer Krusen, president of the College, formally opened the exercises. Rev. J. A. McCallum delivered the invo-

cation. The Hon. Harry A. Mackey, Mayor of Philadelphia, then addressed the vast assemblage that filled the auditorium. The dedicatory address was delivered by the Hon. Hampton L. Carson, son of Dr. Joseph Carson, one of the early professors of the College and one-time editor of the *American Journal of Pharmacy* (1836-1850). Scholarly—and replete with happy reminiscences of Proctor, of Griffith—Bache—Wood—such was the character of the address. It



Honorable Harry A. Mackey, Mayor of Philadelphia

will long be remembered by those who were fortunate to hear it. At the close of the address the official transfer of keys was formally done as follows:

Mr. Norman Hulme, Architect,

to

Mr. Otto W. Osterlund, Chairman of Building Committee and of Finance Committee

to

Dr. Wilmer Krusen, President of the College,

to

Dean Charles H. LaWall and to Dean J. W. Sturmer.

The second part of the exercises was held on the evening of the same date, at 8 P. M. It took the form of a reception and opening ceremony. Mr. Joseph W. England, chairman of the Board of Trustees, presided. His opening address is printed herewith:

"I bid you a most hearty welcome on behalf of the Philadelphia College of Pharmacy and Science. We meet here today to dedicate this new building with pride in the past of the College, with joy in the present, and with faith in the future.

"The origin of the profession of pharmacy in this country, or rather its independent existence, was, strange as it may seem, indirectly due to the influence of Benjamin Franklin (1706-1790), because it was Franklin who had his protege, John Morgan (1735-1789), elected apothecary of the Pennsylvania Hospital in 1755, and gave him material aid later in his medical studies abroad, so that when Morgan, the physician, returned in 1765, he founded the Medical School of the College of Philadelphia, lectured on the theory and practice of medicine, and strenuously fought for the separation of the profession of pharmacy from the profession of medicine, with resultant success.

"One hundred and seven years ago *today* sixty-eight pharmacists, mostly members of the Religious Society of Friends, met in Carpenter's Hall—that historic shrine in which civil liberty was born—to formulate those measures that led to the institution of the first college of pharmacy in the land and the birth of American pharmaceutical education. These men 'builded better than they knew.' Today, there are seventy-five colleges of pharmacy in the United States and their graduates are to be found in every State of the Union, practicing their profession for the relief of the sick and the promotion of the public health.

"The history of the College is one that may well fill us with pride when we think of its small beginning and its wonderful development. In 1821 the College had quarters in a small building on Seventh Street above Chestnut, for which $200 yearly rental was paid, with two professors, no laboratories, and perhaps half a dozen students. Twelve years later it moved into a building of its own on Zane (now Filbert) Street above Seventh, and thirty-five years later into the Tenth Street building, where it has remained for sixty years.

"The first fifty years of the College were the hardest for the outlook was often dark and discouraging. The late Robert Shoemaker, a devoted member of the College from 1843 to 1897,

and vice-president for many years, once told me that 'In its early years the College was a very modest institution with a very limited income.' There were then no pre-requisite laws of pharmacy compelling attendance on colleges of pharmacy as now and students were few in number. My own father once told me that the number in his graduating class of 1846—eighty-two years ago—was only eleven. Progress was slow in those days, but it was sure, and it is of interest to note that Professor Joseph Carson—the father of the orator of today, Hampton L. Carson, Esq.—in addressing the graduating class of 1846, said (A. J. P. 1846, 81); 'It is an undeviating law of nature, trace it where you may, that formations of rapid growth are proportionately unstable, while those that are tardy in the attainment of their full dimensions, and acquire but slowly their strength and vigor, are firm and unyielding. The same rule is applicable to the results of human enterprise, in which category may be ranked professional success.' So with lofty ideals and a firm faith in the importance of their work to sick and suffering humanity, the members of the College 'carried on' the work of the College at great sacrifice of their modest means, and of their time, and builded for the future. All honor to them!

"Equally as deserving of honor are the members of the faculties of the College, embracing such eminent teachers as Wood, Bache, Griffith, Carson, Bridges, Proctor, Thomas and Parrish, who gave national fame to the institution.

"During the past fifty years the growth of the College has been most gratifying, due both to the amazing development of education in general throughout the United States, and of education in pharmacy and the allied sciences in particular.

"Fifty years ago there were fifteen colleges of pharmacy, now seventy-five. Then, there were no definite entrance requirements in colleges for pharmacy students; now, four years of high school is required. Then, there were night classes and few colleges had laboratory work, and this latter was not obligatory; now, the instruction is given in day classes, and night work is not accepted by State Boards of Pharmacy. Then, there were only three branches taught in colleges of pharmacy—pharmacy, chemistry and materia medica—and no obligatory quiz instruction; now, with nine or ten branches and individualized instruction, some of the colleges have as many as forty-five teachers. Then, the courses began in the fall and concluded in March; now, the school year is eight to nine months long. Then, the longest course was two years; now, it embraces three college sessions.

"Probably the most important factors in the development of the College during the past half century has been its capable business administration and the association with it as members of its faculties, of such eminent authorities as Maisch, Remington, Sadtler, Power, Trimble, Bastin, and Kraemer; and this eminence of teachers, it is but fair to say, is being maintained by the faculty of today.

"Other factors have contributed, such as the organization of the Alumni Association of the College in 1864, which body has been a potent force in forwarding movements for the upbuilding of the institution; the passage of the Pharmacy Law of the City of Philadelphia in 1872; the enactment of the Pharmacy Law of the State of Pennsylvania in 1887; and the supplementary legislation, especially the pre-requisite pharmacy law, and the Federal and State Food, Drug, Narcotic and other laws, all of which tended to demand higher and higher requirements of the pharmacist.

"Today the name and fame of the College is known wherever the language of pharmacy and allied sciences is spoken. The College has become 'a veritable university of pharmacy and allied subjects.' And this rich inheritance comes to us with very definite duties and responsibilities. We must maintain the principles and traditions of those who have gone before and justify their faith in us.

"In this new building we have a Temple of Education that will be a worthy memorial to the founders and of lasting credit to American Pharmacy and the Allied Sciences. So, let us rejoice in our glorious past, cheer the present, and face the future with faith, and hope, and confidence."

Brief verbal messages by delegates of scientific societies and colleges were then presented as follows:

Dr. Arthur C. Morgan, President Penna. State Medical Society
Dr. I. P. Strittmatter, President Phila. Co. Medical Society
Dr. Orlando H. Petty, President Phila. Medical Club
Dr. Frank C. Hammond, Dean of the Medical Dept., Temple University; Editor *Atlantic Medical Journal*
Dr. George H. Meeker, Dean of the Graduate School, University of Pennsylvania
Dr. Martha Tracy, Dean of the Woman's Medical College of Penna.

Dr. John R. Minehart, Dean of the Dept. of Pharmacy, Temple University

Dr. H. H. Rusby, Dean College of Pharmacy, City of New York.

Dr. E. F. Kelly, of Baltimore, Md., Secretary American Pharmaceutical Association

Mrs. Bertha L. DeG. Peacock, President of the Alumni Association, Philadelphia College of Pharmacy and Science

Dr. E. Quinn Thorton (Class of '89), Asso. Prof. of Therapeutics, Jefferson Medical College

W. B. Goodyear, President Penna. Pharmaceutical Association

George W. Fehr, Philadelphia Association Retail Druggists

Raymond Hendrickson, Philadelphia Branch American Pharmaceutical Association

Ambrose Hunsberger, National Association of Retail Druggists

Mrs. William E. Lee, Women's Organization National Association Retail Druggists.

Antonio G. Llamas, President Manila College of Pharmacy, Manila, P. I.

Messages were received from:

Dr. A. C. Taylor, President National Association Boards of Pharmacy

Dr. Charles F. Kramer, Secretary Pennsylvania Board of Pharmacy

Charles C. Campbell, Pittsburgh College of Pharmacy, Pittsburgh, Pa.

Letters and telegrams were read from numerous friends and Alumni of the College. A number of representative communications follow:

"AMBLER, PENNA., U. S. A.

"Feb. 23, 1928.

"To the Alumni of the
"Philadelphia College of Pharmacy.

"GREETINGS!

"As your President of fifty years ago, I bid you welcome to your new home, but infirmities of age prevent my being with you tonight.

"At the end of a busy life, however, I hand you the torch of progress, and bid you 'carry on'!

"Yours respectfully,

"RICHARD V. MATTISON, M. D.

"Dr. RVM:E
"To Mr. J. W. England,
c/o Philadelphia College of Pharmacy,
"44th & Kingsessing Avenue,
"Philadelphia, Penna."

"HENRY J. SCHMIDT, Ph. G.
"747 Rahway Street, Elizabeth, N. J.

"To the Secretary of the P. C. P. & Science:

"With this I send greetings, but cannot possibly attend any of the functions of the Alumni. With my best wishes for my Alma Mater I remain,

"Respectfully,

"HENRY J. SCHMIDT, Ph. G.
"Feb. 22, 1928. Class 1873."

"JOHN URI LLOYD
"300 West Court Street
"Cincinnati, Ohio

"February 20, 1928

"Miss Bertha L. DeGraffe Peacock,
"President, Alumni Assn.,
"Philadelphia College of Pharmacy,
"Philadelphia, Penna.

"Dear Madam:

"This is to thank you sincerely for your invitation to visit MY College Home, which as you know, perhaps, includes services rendered during the past half century and more. Let me predict for the Philadelphia College of Pharmacy and Science in its new home, the greatest success that has ever come to a teaching institution in America.

"Regretting much that I can not be with you on this occasion, and with kindest regards and best wishes, I am

"Sincerely yours,

"JOHN URI LLOYD."

"UNCAS-ON-THAMES
"Norwich State Tuberculosis Sanatorium
"NORWICH, CONN.
"Dr. Hugh B. Campbell, Supt.

"Feb. 20, 1928.

"To the Faculty and Members of the Alumni Association of the Philadelphia College of Pharmacy and Science:

"Allow me to congratulate you upon the completion and dedication of the College. When I look back upon the old College Building, on Zane Street, and upon the New Building, I cannot realize what has taken place. Professor Remington was one of the members of the Class, which I think numbered thirty-one. I do not know whether any of them are living, but myself.

"My sincere wish is that the College will be as successful in years to come as it has in the past.

"Respectfully yours,

"HUGH CAMPBELL, Ph. G.
"HC/H 1866."

"February 18, 1928.

"Bertha L. DeGraffe Peacock,
"President of the Alumni Association,
"P. C. P. & S., Philadelphia, Pa.

"Dear Fellow Alumna:

"Your very cordial invitation to attend the Housewarming in the new College building on February 24th, is before me and I thank you most heartily for it.

"To my classmates of fifty years ago, I send hearty greetings and I trust that our next reunion may be in the City of Angels, where they will be greeted by more than one hundred fellow Alumni.

"To the College:

"Fruit when ripe falls from off the tree and returns to Mother Earth,
"But we cling to the Tree of Life, awaiting a second birth.
"Thank God that there were men who 'clinged' to the College and are rewarded now by its second birth.
"May it continue in the future as in the past, the World's leading School of Pharmacy and Science.
"In the language of Tiny Tim, 'May God bless you all.'

"Yours cordially and sincerely,

"JACOB D. SMELTZER, '79.

"JDS:ES."

After the presentation of these messages followed an inspection of the new buildings—laboratories, model drug store, museum, library, etc. Dancing, to the music of a splendid orchestra, concluded a remarkable and an historic occasion.

On the following evening a "House Warming"—an informal gathering of Alumni, to renew friendships and to see the institution—

Mrs. Bertha L. De Graffe Peacock

proved, under the able management of Mrs. Bertha L. DeGraffe Peacock, president of the Alumni Association, a most enjoyable affair. It was well attended and with its gastronomic entertainment as well as its musical and terpsichorean offerings, it was a worthy climax to the splendid program planned to celebrate this great occasion for Pharmacy in Philadelphia and throughout the country.

REPORT OF THE ONE HUNDRED AND SEVENTH ANNUAL MEETING OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE

THE ANNUAL meeting of the College was held in the auditorium of the new College building, Forty-third and Kingsessing Avenue, on Monday, March 26th, 1928, at 2.30 P. M., with President Krusen in the chair, and twenty-seven members present.

The minutes of the previous meeting were read and approved. Abstracts from the minutes of the meetings held by the Board of Trustees since the last College meeting were read by Mr. Beetem. Upon motion all actions of the Board as noted in the minutes read were approved.

President Krusen read a report—Mr. England in the chair—of the activities of the College during his regime. The report was upon motion received and ordered, upon motion of Prof. Cook, to be circulated among the Alumni of the College at the earliest opportunity. Other annual reports as follows were then read, Pres. Krusen having resumed the chair.

Curator's Report—By Prof. Arno Viehoever.
Librarian's Report—By Mrs. Ada S. Capwell.
Publication Committee Report—By Dean C. H. LaWall.
Editor's Report—By Prof. Ivor Griffith.
Necrology Committee Report—By Prof. F. P. Stroup.

All of the annual reports were upon motion received and filed, and the recommendations of the publication committee that two honorariums be paid out of the funds of the committee was approved, and the further recommendations of this committee that the usual appropriation from the funds of the College be made was referred to the Board of Trustees.

The following report of the Nominating Committee was made by Quintus Hoch, chairman:

> "In accordance with the by-laws of the College the committee on nominations submits the following list of nominees for offices to be filled by election at this writing:

President: Wilmer Krusen.
First Vice-President: William L. Cliffe.
Second Vice-President: C. Mahlon Kline.

Treasurer: Milton Campbell.
Corresponding Secretary: Joseph W. England.
Recording Secretary: Ambrose Hunsberger.
Curator: Arno Viehoever.
Editor: Ivor Griffith.
Librarian: Mrs. Ada S. Capwell.

Trustees for 3 Years (four to be elected)

Robert S. Sherwin,
Wm. Duffield Robinson,
Paul A. Kind,
George A. Gorgas.

Trustee for 2 Years

Herbert R. McIlvaine.

Committee on Publication
Charles H. LaWall,
Joseph W. England,
John K. Thum
Arno Viehoever,
Julius W. Sturmer,
E. Fullerton Cook.

Report signed by

QUINTUS HOCH, *Chairman.*"

The report was received, and President Krusen declared nominations from the floor in order. None being offered nominations, upon motion, were declared to be closed. There being no opposing nominations for any of the offices to be filled, Prof. F. P. Stroup moved that Chairman Hoch be instructed to cast a single ballot in favor of the nominees submitted by the nominating committee. The motion carried without dissent, and Chairman Hoch cast a ballot in accordance with the motion, whereupon the chair declared the nominees as listed above to have been elected unanimously to the respective offices.

President Krusen announced the following appointments for 1928:

Delegates to Convention of the American Pharmaceutical Association (to report at September meeting):

J. W. Sturmer (Chairman)
Ivor Griffith
Adby Nichols

Delegates to Convention Association of American Colleges of Pharmacy (to report at September meeting of College):

C. H. LaWall (Chairman)
J. W. Sturmer
E. F. Cook

Delegates to New Jersey Pharmaceutical Association Meeting (to report at September meeting):

F. B. Kilmer (Chairman)
J. W. Sturmer
B. C. Goodhart

Delegates to Delaware Pharmaceutical Society meeting (to report at September meeting):

F. X. Moerk (Chairman)
J. S. Beetem

Delegates to Pennsylvania Pharmaceutical Association meeting (to report at September meeting):

Wm. Stonebach (Chairman)
Bertha deG. Peacock
George F. Lee

Committee to audit accounts American Journal of Pharmacy (to report September, 1928):

F. P. Stroup (Chairman)
J. C. Peacock
O. Kraus

Committee on Nominations (to report *two* weeks before September meeting):

Quintus Hoch (Chairman)
Wm. Duffield Robinson
J. W. Harrison
Millicent LaWall
A. Hunsberger

Committee on Necrology (to report March, 1929):

F. P. Stroup (Chairman)
J. S. Beetem
F. X. Moerk

Mr. England, on behalf of Mr. Robert W. Chew, presented a copy of the Philadelphia *Gazette* published in 1840, and in an excel-

lent state of preservation. The publication contained an announcement of the College in the form of an advertisement. Upon motion of W. L. Cliffe the secretary was instructed to acknowledge receipt of the publication, and to convey the thanks of the College to the donor, Mr. Chew.

☞Philadelphia College of Pharmacy.—At a stated meeting of the College, held at their Hall on the evening of the 30th ultimo, the following gentlemen were elected Officers and Trustees for the ensuing year, viz:

DANIEL B. SMITH, President.
HENRY TROTH, 1st Vice President.
Dr. GEO. B. WOOD, 2d Vice President.
CHARLES ELLIS, Secretary.
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TRUSTEES.

Warder Morris,	Wm. W. Moore,
Dr. Jos. Carson,	Dr. Franklin Bache,
Edward Roberts,	John Wetherill, Jr.
Jos. C. Turnpenny.	Clement Cresson,
Dillwyn Parrish,	Peter Lehman,
Thomas H. Powers,	Dr. Robert Bridges,
Richard M. Reeves,	Ambrose Smith,
Jacob Bigonet.	James Hopkins.

The following committees were also elected, viz:

PUBLISHING COMMITTEE OF THE AMERICAN JOURNAL OF PHARMACY.

Dr. Jos. Carson,	Dillwyn Parrish,
Dr. Geo. B. Wood,	Elias Durand,
Charles Ellis,	John C. Allen,
Dr. Robt. Bridges,	Wm. Hodgson, Jr.
Dr. Franklin Bache,	Danl. B. Smith.

COMMITTEE FOR REVISING THE UNITED STATES PHARMACOPEIA.

Wm. R. Fisher, Chairman.	Wm. W. Moore,
Charles Ellis,	Thos. H. Powers,
Elias Durand,	John C. Allen.

Extract from the minutes of the College.
ap 9-1te CHARLES ELLIS, Secretary.

Reprint From "The Philadelphia Gazette," Thursday afternoon, April 9, 1840

Prof. Cook announced the selection of Dean LaWall as the Remington Honor Medalist for 1928 by the Committee of the New York Branch of the American Pharmaceutical Association. The news that this honor was to be conferred upon a distinguished member of the College faculty was received with a sense of profound satisfaction by those in attendance.

Reports for inability to attend meeting from Messrs. Evans and McIlvaine were read.

There being no further business to be transacted, the meeting was adjourned.

AMBROSE HUNSBERGER,
Secretary.

ABSTRACTED AND REPRINTED ARTICLES

THE PROMISCUOUS SALE OF HYPNOTICS*

By John R. Minehart

THE ANNOUNCEMENT of the birth of some new form of hypnotic is almost a weekly occurrence. May we inquire if the rapid increase in the number of these preparations (especially those belonging to the barbital group) is in the interest of suffering humanity, or the commercial advantage, primarily, that is the incentive to their manufacture?

It does appear that the methods used in advertising them are not only to acquaint the medical profession with their soothing effects but to appeal to the general public who can readily secure them for self-medication.

A recent report filed in the narcotic division in Washington states that there is one manufacturer who is very persistent in advertising in all journals allied with the medical and pharmaceutical professions and whose chief objective seems to be to make their products so well known that they will be taken up by the laity and extensively used by them.

A rather attractive booklet, "The Mystery of Sleep," was broadcast recently. The following quotation is on the title page: "Whoever is first to discover the true cause of natural sleep and the mode in which it may be commanded by art, for the service of mankind, will be the greatest healer who has up to this age, helped to make medicine immortal."

Quoting from a letter recently mailed to doctors, a certain manufacturer advised the physician (when sleeplessness and nervousness beset him) to try a dose or two of his product. Its pleasing reaction would tell him why the manufacturer was anxious for him to become acquainted with the remedy.

In order to show that some of the medical professors are seriously alarmed at the increased tendency toward these hypnotic drugs I offer the following from recent writings in the A. M. A. and other medical publications. Dr. Irving J. Sands, instructor in Neurology

*Read at the 1927 Meeting of the Pennsylvania Pharmaceutical Association.

at Columbia University and associate Neurologist in two of the New York hospitals, after giving some history as to the discovery of this group of drugs, discusses thoroughly their physiological effect and enumerates a number of cases treated for addiction. In conclusion he states that they should be restricted to the sale of drugs, and on physician's prescriptions. He recommends that physicians should be careful to use the proper chemical term when ordering. Drs. Leak and Ware, of Los Angeles, California, contribute an article as to the value of these hypnotic drugs and their serious after-effect. These authors write that the ease with which such drugs as veronal may be obtained is a public menace and that they should be placed on the list as poisons and sold only on physician's prescriptions.

The September bulletin from the Public Health Department of Philadelphia advises that in the administration of luminal in epilepsy, it should be gradually decreased to the smallest dose capable of holding the patient, and that prolonged administrations of the agent are said by some to cause mental deterioration.

Quoting from the writings of a well-known internist in reference to the action of luminal: "There are three distinct effects noticed in its administration: first, the sedative effect; second, vertigo and decided hypnotic which might be termed 'dopey,' and the third, skin eruptions which are rather resistant to treatment." Therefore, it is decidedly unwise to have these drugs sold by mail and to persons who are not observed and have not been examined by physicians.

Dr. Henry I. Klopp, superintendent of the Allentown State Hospital, commenting upon allonal, veronal, luminal, barbital, also sulphonal and trional, states that none of the aforementioned drugs should be dispensed over the drug store counter other than with a physician's prescription. The reason for this is that any lay person can go to the store and get these drugs. This is dangerous and they are very often taken by the suggestion of some lay individual. He recommends an enactment of law whereby it would become a felony for any drug clerk in a drug store to dispense any hypnotic or sedative drug over the counter except by the certificate of a reputable physician, and the druggist should be compelled to make a monthly statement as to the report of sales.

The superintendent of one of the large sanatariums near Philadelphia writes that veronal and its allies are decidedly habit-forming drugs and it should not be possible for the laity to secure them without a prescription.

A survey of the wholesale reports lately show an increased output of these drugs with two exceptions, that is, sulphonal and trional.

Some of the pharmacists in certain sections of our large cities refused to sell these drugs except on a physician's prescription. When asked why they took this stand, they said that many of the people who called for these remedies were of an undesirable class of customers.

The chief users of these remedies are not only from the underworld as some might think, but from a certain group of the wealthy (leisure) class, known to have a psychopathic tendency.

Great Britain, as well as a few of our States, has enacted laws for the control of these agents. The States have had considerable difficulty on account of the traffic carried on by vendors. New York is considering the repeal of their enactment. Surely if as a last resort we are forced to have legislation as to their control, it should be a national enactment. I trust that the pharmacists will carefully consider any such legislation for there is no other group of our citizenry so regulated as to their duties as the pharmacist.

It is not my intention to discredit the therapeutic value of these agents, but to ask the question: "Is there a promiscuous sale which should be controlled, and if so, would it be wise for the doctors and pharmacists to broadly discuss this subject and to at least consider some plan of regulation?"

The pharmacist might suggest this, that if it can be definitely shown that the recurrent use of these hypnotic drugs exert a harmful physiological effect upon the user, then this fact should be required to be set forth on the package in which the drug is marketed, in the plainest, most prominent manner possible, printed in ink of a different color from the body of the text and even in larger print than the body of the text. In this way it would rivet the attention of the user upon the notice. By this method of giving due publicity as to the careful use, it would control advertising, which is valuable, and also render unnecessary the keeping of records and the making of reports of which there are already more than enough.

HAS PROHIBITION IMPROVED PUBLIC HEALTH?*

LOUIS I. DUBLIN (*Am. J. Pub. Health* 18:1 [Jan.] 1928) has analyzed two groups of mortality data for the twenty-six-year period 1900 to 1926, and those of a large area of the country, known as the U. S. Death Registration Area, as constituted in 1900. These are the six New England States, New York, New Jersey, Michigan and Indiana. Together, these ten States contain 26.1 per cent. of the total population of the country. Records of mortality have been kept with great accuracy in this area for the entire period since 1900. These States, moreover, are fairly representative of the country as a whole. While their people live chiefly in urban industrial areas, they have also a fair proportion of rural residents; namely, 25 per cent. The second group is composed of millions of men, women and children, who are insured in the Metropolitan Life Insurance Company and whose mortality experience it has been possible to follow very closely since 1911. He contrasts the trends of population mortality for both groups in two periods, that from 1900 to 1917, inclusive, with that from 1921 to 1926, inclusive. It is shown that the level of mortality in the prohibition years has been clearly lower than in the earlier years, both in the general population and among the insured. In the general population the average death rate between 1921 and 1926 was 16.9 per cent. lower than in the earlier period. Among the industrial policyholders the average death rate was 26.2 per cent. lower in the prohibition period than in the earlier one. The improvement in mortality during the period between 1921 and 1926 was entirely limited to the group of white females.

As to age, the prohibition period is characterized by sharply declining mortality rates among children and adolescents of both sexes; and this decline is characteristic of a number of additional age periods among women. The improvement is retarded among young male adults, and disappears altogether during the middle years of life in that sex. In fact, the mortality has definitely risen among men after age thirty-five. Social workers are virtually in accord that the years since 1920 have seen an improvement in the economic condition of the homes of the great mass of American people. Never before have savings deposits been so great or have life insurance policies been added to and maintained as during the last six years. Re-

*Reprinted from the *Jour. Amer. Med. Assoc.*

tail trade has never experienced such prosperity. All of this emphasizes what is universally observed; namely, that the housewife now has more money to spend on the necessities of the household, on food, on clothing, and on shelter to a degree that has never before been possible for so many.

During this prohibition period there has been a constant rise in the death rate from alcoholism and from the associated condition of cirrhosis of the liver. Both of these diseases were at a minimum in 1920. They are now at a point almost as high as in the decade prior to prohibition. Beginning with 1920 there has been a continuous and marked rise in the number of deaths resulting from the use of alcohol. In 1920 the death rate from this condition reached its minimum, 1.3 per hundred thousand. Every year since then, virtually without exception, has seen a rise and the rate is now more than three times as high as it was only six years ago. In Maryland the alcoholism death rate in 1926 was the highest ever recorded since 1911. In Rhode Island, Michigan and New York the 1926 rate was the highest with a few exceptions. The records of hospitals for the insane tell a similar story. The year 1920 showed the lowest rate for admissions to hospitals for mental disease due to alcoholism. Since that year the admission rate has increased step by step and last year saw conditions three times as bad as six years ago.

In the country over, with very few exceptions, there is a mounting rate from alcoholism and from the associated diseases among the male population. This situation is in striking contrast with what has occurred in neighboring Canada. In the Dominion, likewise, several provinces have been experimenting with one form or another of regulatory legislation. But in that country there is as yet no evidence of any untoward result in the mortality rates for any large group of the population.

The experience of the Metropolitan Life Insurance Company in Canada is especially instructive. Among more than 1,000,000 policyholders there have been recorded only 100 deaths from alcoholism and acute alcoholic poisoning during the entire period 1911 to 1926. The deaths from alcoholism have gone down during the last ten years in Canada—a condition very different from that in the United States. Much more important than the deaths from alcohol are the deaths from the degenerative diseases such as heart diseases, kidney disease and pneumonia, which are apparently on the rise. Just how far the indulgence in alcohol will explain these increases it is impossi-

ble to say. But in any case there is no indication as yet of a tendency toward improvement in these among American men. The effect of the prohibition legislation on the public health has clearly not been uniform among the various groups of the American population. Absolute prohibition prevails hardly anywhere and affects as yet only small numbers of people. The effect of the prohibition situation on the public health has probably been good where there has been prohibition to an appreciable degree, and the situation has been unsatisfactory to the degree in which there has in fact been no prohibition. Especially is this true in those areas of the country and among those classes of the people where there has been drinking of the highly deleterious stuff that passes for alcoholic beverages these days. Such a conclusion is at once consistent with the facts at our disposal and squares with what has generally been accepted as the true relation existing between heavy alcoholic indulgence and individual health.

SCIENTIFIC AND TECHNICAL ABSTRACTS

High-Temperature Whitewash—Whitewash to be used in improving the appearance of brickwork in boiler settings and other places where it is subject to heat.

"Prepare a thin slurry by stirring finely ground lime into five gallons of water. Slowly add, with stirring, five pounds of salt, five pounds of plaster of Paris and one-half pint silicate soda. Apply immediately with a paint brush to brickwork. Addition of the silicate too quickly or in excess will cause the slurry to become thick and useless as a paint.

"Such a wash was made and applied to the side walls and parts of an 800-ton regenerative glass furnace with excellent results. It was found much more desirable to apply two thin coats rather than one single heavy coat. The amount of wash required depends on the character of the clay surfaces."—(*Scientific American.*)

The Lower Fatty Acids of Cocoanut Oil—A systematic fractionation of about 130 kg. of methyl esters of cocoanut oil acids

has been carried out by Taylor and Clarke. The lower fatty acids have been found in the following percentages:

	Per Cent.
Methyl caproate	0.47
Methyl caprylate	8.0
Methyl caprate	5.7
Methyl laurate	45.2
Methyl myristate	16.5
Higher esters	23.4

These results give definite information as to the quantitative distribution of the various lower acids in the original oil. The following acids have been isolated from the esters: Caproic acid, caprylic acid, capric acid, lauric acid, and myristic acid.—(*Jour. Frank. Inst.*)

CHEMICAL EFFECTS OF SOUND WAVES—Loomis and his co-workers have shown that many metastable systems are discharged by sound waves. Nitrogen tri-iodide, perhaps the most popular metastable chemical system amongst first-year students, is exploded when subjected to intense radiation. This was demonstrated by the American workers in a fascinating way, for an "accumulator of radiation" was employed in the form of a fine filament drawn from the neck of an Erlenmeyer flask, the bottom of which was suspended in the radiated oil. The nitrogen iodide, plastered on the filament in a moist condition, collected in beads in standing waves in the glass filament, and was exploded progressively from top to bottom of the filament as drying occurred.

Similarly, yellow mercuric iodide was converted into the red modification below 120° C. by the sound waves. Further, the intense sound waves had an explosively discharging effect upon superheated liquids and carbon tetrachloride, superheated 5° C., evaporated violently under the influence of the waves. Carbon dioxide was violently released from its super-saturated aqueous solutions when "rayed." A final instance of the effects of high-frequency sound waves may be quoted, namely, the atomization of a substance at a liquid or gaseous interface. Emulsions of metallic mercury in water have been made which reduced potassium permanganate and remained in suspension for several days. A test tube of distilled water, clear to the Tyndall beam before raying, became turbine after raying, due to small glass fragments which were atomized from the walls of the tube.—(*Chem. & Industry*, Feb. 24, 1928, p. 196.)

Stainless Iodide Ointment—According to tests carried out by the author on ointments prepared by the formula given in the Australasian Pharmaceutical Formulary, Remington's "Pharmacy," and the B. P. Codex respectively, the amount of combined iodine is A. P. F. 90 per cent., Remington about the same, B. P. Codex about 87 per cent. It is suggested that in the former two ointments the iodine has combined with the oleic acid rather than the vaseline, and that the evidently weaker combination in the B. P. Codex ointment may be of clinical advantage. The author finds the A. P. F. ointment answers well, both pharmaceutically and clinically, except for the complaint that occasionally it causes some irritation.—J. Lunn (*Austral. Jour. Pharm.,* New Series, Vol. 9, No. 97, 57—through *Pharm. Jour.*).

Metals in Our Food—A summary of findings in the interesting study of Drs. Flinn and Inouye is as follows:

Copper, zinc, manganese, iron, aluminum, nickel and cobalt are commonly found in plant and sea food. Lead, a recognized body toxicant, is not.

Copper, zinc, manganese, tin, iron and aluminum are generally present in the human body, but with the exception of iron do not have any known function in the vital economy of the organism.

Copper, nickel, tin and aluminum are practically all eliminated in the stools; the excretion of zinc is divided equally between the urine and the stools.

Metallic salts ingested with food combine with the proteins of the food and are rendered harmless except when the metallic salt is present in excessive amounts, or perhaps in cases of hyperacidity. All metallic salts ingested during the absence of food in the stomach have a deleterious effect.

Copper, nickel, zinc, tin and aluminum are all attacked by acids or alkalis during the cooking process, the amount dissolved depending roughly on the acidity or alkalinity of the food.

All food having a metallic taste from these dissolved metals are unpalatable and irritate the gastro-intestinal tract.

Animals will not ingest large amounts of copper and nickel salts in one dose. If the same amount is mixed with the food and fed throughout the day, the animal will ingest it without discomfort or ill effect. Animals can ingest relatively larger amounts of tin, zinc or aluminum salts in single doses.

Copper, zinc, aluminum and nickel are not classified as industrial poisons because of the absence of any evidence of chronic or acute poisoning in industrial plants. Nickel poisoning has been reported from nickel carbonyl.

There is no scientific evidence of any chronic poisoning taking place from food cooked in aluminum utensils. Large doses of aluminum salts, like copper and nickel, will cause gastro-intestinal disturbances when excessive amounts are dissolved.

Tin apparently does not affect the human system, but because of its cost its use in cooking utensils is prohibitive.—(*J. A. M. A.* **90**:13, March 31, 1928.)

THE COMPOSITION OF PEANUT BUTTER—This article is now sold widely and in considerable amount, yet there has been but little published as to the composition of it. It is obtained by grinding finely the roasted and cleaned peanut from which the outer covering and germ have been removed. Detailed analyses of twenty-two samples as found in the open market are given in the March issue of *Health,* a publication of New Hampshire State Board of Health, Mr. Charles D. Howard being the chemist of that board. As the butter includes all the edible portion of the nut, it has the food value thereof. The amount of fatty matter present is almost the same as that in chocolate, but the protein content is much greater, constituting over 30 per cent., and far in excess of that in butter. A notable amount of assimilable carbohydrate is also present. While vitamin A is in much smaller amount than in butter, some vitamin B is present. It seems that the article deserves to be ranked as a nutritious food.

The analyses given in the report show that the commercial supply is of fairly uniform and good quality, the fat averaging about 38 per cent., the protein about 30 per cent., the carbohydrates other than fiber about 15 per cent. Of the twenty-two samples examined, two were under weight, one containing only 12.3 ounces, the other 15.2 ounces, though the cans bore a claim for one pound net. These were from the same firm.

EXTRACTION OF VOLATILE OILS—Methods for extracting the volatile oils, or as they are sometimes called, the essential oils, from various species of plants, are divided into three main classifications, according to Arthur F. Sievers, of the United States Department of Agriculture, author of a new pamphlet dealing with production of

these oils in the United States, and particularly with the steam distillation of the oils which is the principal method used in the United States.

Extraction by solution is the method used for obtaining some of the more delicate odors, principally those of flowers, and the products are used mainly in the compounding of high-grade perfumes.

Extraction may also be achieved by expression, particularly of orange, lemon, and bergamot oils. As used in Europe, this method, too, demands an ample supply of cheap, skilled labor, not available in the United States.

Turpentine distilling is the most important example of essential oil production by steam distillation, but since there are a number of separate publications on this industry, it is not covered in this bulletin. Next to turpentine, peppermint oil constitutes the largest volatile-oil industry in the United States, with an annual production of from 350,000 to 400,000 pounds. The principal production areas are in Michigan, Indiana, and on the Pacific Coast. On the average, an acre of mint produces about thirty pounds of the essential oil which is used largely as a flavoring agent for candies, chewing gum and tooth pastes. It possesses medicinal qualities and is used extensively in medical practice.

In addition to peppermint, the crops cultivated for oils include spearmint, Japanese peppermint, which yields an oil rich in menthol; American wormseed, cultivated principally in Maryland, and wormwood, tansy and dill.

Other oils of more or less commercial importance listed are sassafras, wintergreen, sweet birch, erigeron, witch-hazel, eucalyptus, and pennyroyal, which are extracted from wild plants, and for the most part on a relatively small scale, which in some cases is being reduced as the supply of available material decreases.

Distillation of the oils requires three principal pieces of apparatus—a boiler to generate steam, a retort where the plant material is subjected to the steam, and a condenser for the condensation of the steam and oil mixture. Receptacles are provided in which the condensed steam and the oil separate by gravity, after which the oil is purified by appropriate processes. Plant material, which can not be easily packed, may first be crushed or chopped before it is loaded into the retort.

Technical bulletin 16-T, entitled "Methods of Extracting Volatile Oils from Plant Material and the Production of Such Oils in

the United States," also includes suggestions and drawings for the design and construction of volatile-oil stills in both experimental and commercial sizes. It is available for free distribution to those interested who apply to the United States Department of Agriculture, Washington, D. C.

MEDICAL AND PHARMACEUTICAL NOTES

Ephetonine—Ephetonine is the hydrochloride of phenylmethylaminopropanol, $C_6H_5.CHOH.CH(NH.CH_3).CH_3.HCl$; it has a structural formula identical with that of ephedrine and nearly related to that of adrenaline. Ephetonine is a white, crystalline powder, soluble in water and in alcohol. Its solutions are optically inactive, whereas the aqueous solution of ephedrine is dextrorotatory while its alcoholic solution is lævorotatory.

Pharmacologically, ephetonine, like ephedrine, possesses a protracted adrenaline-like action, raising the blood-pressure, and strengthening the heart-beat and the respiratory center. It dilates the bronchi, and exerts a mydriatic effect. It is said to have the same advantages over adrenalin as has ephedrine: it is effective by the mouth and is comparatively non-toxic.

Kreitmair reports that it has all the pharmacological action of ephedrine; Petow and Wittkower have had good results from its use in twenty cases of asthma. The dose varies from 0.005 to 0.05 gm. (one-twelfth to three-fourths grain), and its effects are observable within half an hour.

Ephetonine is manufactured by Merck, of Darmstadt. It is put up as tablets of 0.05 gm. and in ampoules containing 0.05 gm. in one cc. One tablet is to be taken when asthmatic attack occurs, followed by another half to one hour later if necessary. The ampules are for injection in cases of reduced blood-pressure and other conditions in which adrenalin is usually employed. Ephetonine powder may be used for sprays, ointments, etc., the usual strength being 5 per cent.

Oldest Medical Book Translated Into English—Skilled surgeons in the valley of the Nile knew more about human anatomy than their descendants of the Middle Ages, thousands of years later.

This is one of the surprising facts revealed by the translation of the Edwin Smith Papyrus, the oldest scientific book in the world, which has been completed by Prof. James Henry Breasted, well-known Egyptologist of the University of Chicago. The manuscript is now being printed for the New York History Society, the owner of the document, by the Oxford University Press, which is the only place at the present time that has the facilities for setting up the ancient hieroglyphics in type.

The papyrus is regarded as the most important document in the history of all science that has come down to us from the time before the ancient Greeks. It is remarkable in that it shows an amazing approach to the attitude of the present-day scientist, in striking contrast to the long lists of mingled charms and recipes that constitute a large share of the medical papyri of ancient Egypt.

Some of the diagnoses and treatments of injuries set down by the author-surgeon of 1700 B. C. in his orderly arrangement of cases are surprisingly modern. He made the first observation that has survived that the brain is the center of nervous control; he felt that the heart and brain played an important role in our physical make-up; and he knew something of pulse or pulsation and of the circulatory system.

He divided his diagnoses into three groups, according to the seriousness of the injuries: one, "an ailment which I will treat"; two, "an ailment I will contend with"; three, "an ailment not to be treated," meaning probably those beyond the reach of his skill.

Among the mechanical appliances which appear for the first time in medical literature in this papyri include a kind of vegetable lint used to absorb blood, linen bandages manufactured for surgical use, adhesive plaster of linen, and surgical stitching of wounds. The most remarkable observation in the ancient manuscript, which was probably intended as a textbook, is in connection with a case of compound fracture of the skull with no visible external contusions. The old Egyptian surgeon noted that both the eye and gait of his patient were altered on the same side of the body as that on which the head injury had occurred, one of the earliest known observations that injury of the brain may result in disturbance of normal control of various parts of the body.—(*Science Service.*)

New Mercury Diuretic: 440-B or Neptal—The diuretic action of mercury salts has received attention from pharmacologists

recently, and research is being carried out to produce compounds of weak toxicity and maximum diuretic action. A large amount of work has been done in recent years, and novasurol and salyrgan have been studied in Germany and the English-speaking countries. Salyrgan, introduced in 1923, is a compound of mercury and sodium salicylallylamido-acetate in 10 per cent. solution. Neptal or 440-B introduced by Fourneau and Girard ("Union Pharmaceutique," December, 1927) resembles salyrgan in that it is an addition product of mercuric acetate and salicyl-allylamido-acetic acid. Solutions of 440-B are prepared not with sodium, but with ammonium chloride, and are in this condition more stable than those of salyrgan, being specially convenient for intramuscular injection. The product is obtained in the form of a solution in ampules of 2 cc. containing 0.092 gm. active product per cc. Clinical research on neptal shows that a single injection of 1 to 1.5 cc. of the solution induces diuresis in an hour, and the total amount of urine passed in twenty-four hours reaches four and even seven litres. An interesting peculiarity of neptal is the appearance, three or four days after the injection, of a secondary diuresis which completes the action of the first. New injections should be repeated at intervals of a week. It should not be administered to febrile patients as there is danger of a relapse.—(*Chemist & Druggist.*)

Sterilization of Hypodermic Syringes—Delcourt-Bernard ("Union Pharmaceutique," March 15, 1928) recommends the following simple method of sterilizing hypodermic syringes and needles without the use of heat: The syringe, or needle, is washed, carefully dried, then placed in acetone, taking care to ensure that no air bubbles remain adherent. After a sojourn of one minute in the acetone the syringe is removed, the acetone evaporated by shaking, whereupon a mixture of vaseline, 5 grams; lanolin, 5 grams; and ether, 100 grams, is drawn up into the syringe, and expelled after one or two minutes; the syringe is now sterile and ready for use.—(Through *Chemist & Druggist.*)

Manufacturers Recommend Tolerances for Certain Medicinal Tablets—The Contact Committees of the American Drug Manufacturers Association and the American Pharmaceutical Manufacturers Association have submitted to the Food, Drug and Insecticide Administration, United States Department of Agricul-

ture, their fourth report containing recommendations for tolerances on certain medicinal tablets. They have indicated the degree of accuracy within which properly manufactured medicinal tablets can be made under present-day manufacturing methods.

This report covers recommendations on eleven compressed tablets and includes recommended methods of analysis. The tolerances suggested by the combined Contact Committees for the compressed tablets mentioned are as follows:

Acetphenetidin	7½ per cent.
Acetylsalicylic Acid	7½ " "
Ammonium Chloride	6 " "
Methenamine	6 " "
Potassium Chlorate	6 " "
Potassium Iodide	6 " "
Potassium Permanganate	6 " "
Quinine Sulphate	9 " "
Sodium Bicarbonate	7½ " "
Sodium Salicylate	9 " "

The proposed standard for Chloramin-T tablets is that they shall contain active chlorine corresponding to 10.3 per cent. to 14.3 per cent. of the labeled amount of Chloramin-T.

Complete copies of the report, including the suggested assay processes for the various tablets, may be obtained from the Food, Drug and Insecticide Administration, United States Department of Agriculture, Washington, D. C.

NEWS ITEMS AND PERSONAL NOTES

Dean Charles H. LaWall Honored Again—The Remington Honor Medal is not the only recognition that has recently come to Dean LaWall. A signal honor, recently conferred, is his election as Alumni Member of the University of Pennsylvania Chapter Sigma Xi fraternity on March 28, 1928.

At about the same time he was elected Honorary member of American Medical Editors Association, with request to serve on the Committee of Pharmacy and Therapeutics.

J. M. Woodside, Member of State Board of Pharmacy—John M. Woodside, retail pharmacist, 2902 Richmond Street, Philadelphia, has been appointed a member of the Pennsylvania Board of Pharmacy by Governor Fisher to succeed Walter Rothwell, Hatboro, Pennsylvania, resigned. Mr. Woodside is a graduate of the Class of 1905 of the Philadelphia College of Pharmacy and Science, secretary of the Kensington Association of Retail Druggists, and editor of the bulletin of the P. A. R. D. His appointment was urged by a committee of officers of the State Pharmaceutical Association and of the pharmacy colleges.

Hay Fever Time—Another hay fever season is at hand and physicians can render their patients a great service indeed by suggesting to them the use of desensitizing treatment with extracts of the offending pollens.

The two principal forms of pollen extracts, the aqueous and the glycero-saline, are both supplied by the H. K. Mulford Company for the four primary pollen groups—Timothy, Ragweed, Lamb's Quarters, Wormwood. In this connection it is of interest to note that 90 per cent. of the hay fever patients respond to one of these four pollens.

A very interesting booklet giving a wide survey of modern hay fever treatment has just been published. It discusses methods of diagnosis, preseasonal and seasonal desensitizing, the range of usefulness of the Mulford Hay Fever Treatment, the forms in which it is offered, and its adaptability to the needs of the individual patient. A copy of this booklet may be had upon writing to H. K. Mulford Company, Philadelphia.

Constructive Advertising—Merck & Company have announced a splendid program of advertising which has for its motif the depiction of the prescription druggist as the public should know him. The first of the series takes the form of a page advertisement in the May number of *Hygeia,* the health magazine published for the public by the American Medical Association. In this series Merck & Company hope to make clear why it is to the real interest of the general public to give a generous measure of its support to the prescription pharmacy. Too often it is regarded as merely a place where prescriptions are taken and medical supplies obtained when people are ill; and where, otherwise, small conveniences may be pur-

chased when other stores have closed their doors for the night—or the holiday.

The purpose of the campaign is explained as follows:

> "We are not unselfish in undertaking such educational work. Our business is vitally concerned with drug stores in which prescriptions are compounded and fine chemicals dispensed by pharmacists with special education and technical skill. While we realize fully that the pharmacist of today must also be a merchant, and sell many side lines in order to make a living, we also know that he cannot afford to have his store looked upon as just that of another merchant—a danger to which modern tendencies expose him. His professional duties and his services to the people of his neighborhood entitle him to a large measure of their patronage. Only with such support can he maintain his pharmacy, in equipment and efficiency, so that it may best serve the need of his community and its physicians."

BOOK REVIEWS

THE THEORY OF EMULSIONS AND THEIR TECHNICAL TREATMENT. By William Clayton, D. Sc., F. I. C. With a preface by Professor F. G. Donnan. 2d edition. 8vo., xi-283 pages, 42 illustrations. Philadelphia, P. Blakiston's Son & Co. $4.50.

The physics and physical chemistry of emulsions are parts of Colloid Chemistry, but although of much practical importance and theoretic interest, the subject has not received sufficient treatment in the general works. The first edition of the work in hand was translated into German, no small honor, for Germany has been in the forefront of the science of the colloidal state. It is true that among the first to explore the field was the British chemist, Graham, to whom we owe the terms "colloid" and "crystalloid."

Apart from the value of the study of emulsions in shedding light on the laws of surface tension, adsorption, Brownian movement and many other physical phenomena, it has great value in biochemistry, biophysics and technology. Much attention is given in the work to the practical applications of the centrifuge in breaking up emulsions, frequently an important problem in manufacturing chemistry. Great advantage has resulted in recent years in the use of very high speed apparatus by which even stubborn emulsions may be broken.

Many years ago Leffmann and Beam, in a note in *The Analyst,* called attention to the use of the centrifuge in breaking the emulsions that are obtained in the laboratory in extractions with immiscible solvents, but at that time, only comparatively low speed hand machines were available for laboratory use and sometimes unsatisfactory results were obtained. The relations of finely-divided materials to the suspending liquid are often quite peculiar. The application of oils to flotation of ores and the use of a mixture of oil and water to separate diamonds from other crystalline minerals are examples of such relations. In the physiology of animals and plants, the phenomena of emulsion are complex and important. Latex, for instance, that peculiar secretion of plant tissues which characterizes several large families, is an example. One form of latex, rubber, has acquired world-wide importance and may prove indeed to be a cause of serious friction between some of the great nations.

This book is a valuable contribution to the subject of which it treats and the matter is presented clearly and in excellent form.

HENRY LEFFMANN.

DIE NATÜRLICHEN PFLANZENFAMILIEN. Vol. 3, Chlorophyceæ. Edited and revised by H. Printz. 8vo., 463 pages, 366 illustrations. W. Englemann, Leipzig, paper cover, 31 mks., bound, 41 mks.

This is one of the many volumes of descriptive and systematic botany that have been published under the initiative of Engler and Prantl and are so well and favorably known to botanists in every part of the civilized world. The present volume maintains the high standard that has characterized the work since its beginning.

The subject matter is the chlorophyllaceous algæ, and includes the vast mass of information that has been accumulated concerning these plants, often called "lowly" because of their apparent less complexity in structure and influence than the so-called "higher" forms. The part, however, that a given class of organisms plays in nature cannot be always or even usually fully judged by us, and our distinctions may be misleading. Certainly, the microbes have a powerful influence on human affairs. The children's song about the "little drops of water and little grains of sand" might have a new verse glorifying the enzymes and bacteria.

This book is a splendid example of the thoroughness and accuracy which characterizes German science. The illustrations are very numerous and of the highest quality. The text, printed in clear Roman type, is lucid and in full detail. One notices, of course, the modern tendency of German writers to use Germanized terms instead of the usual terms derived from Latin and Greek. This is unfortunate as it burdens science with so much terminology. It seems a pity that the word "agamic" should be discarded and its place taken by "ungeschlechtliche." Nationalistic influences are, of course, operative to a large extent in such cases, but the word "agamic" represents no antagonism to any modern nation.

In this work the student of the algæ will find a complete and comprehensive manual. The illustrations are abundant, serve to illuminate every portion of the text, and are masterpieces of accuracy and clearness of detail. Magnifications are always indicated, an important point, often neglected in such works, but an unusual method is used. Thus instead of x20, the form is 20/1. This system seems to have no advantage over the method in general use.

Space does not permit of a detailed presentation of the many interesting facts given in the volume. The enormous number of specific forms described impresses one powerfully as to the difficulty of the problem of evolution. It seems evident that natural selection, as Darwin described it, must have had influence in bringing about permanent modifications, yet the immense number and variety of forms make a great difficulty in comprehending how such a cause could produce such results. After all the scientist will be concerned best with accumulating facts and presenting them in proper form to the world, and a work like the one in hand is a splendid example of this method. The object of science is the discovery of truth and the duty of the scientist is to proclaim his established results. To such a volume as now under review, wide use is sincerely to be wished.

HENRY LEFFMANN.